SITE INVESTIGATION REPORT

Former Kilauea Sugar Company, Ltd. Mill Pesticide Mixing Area
Along Aalona Street and Oka Street
Kilauea, Hawaii

Prepared for:

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Executive Summary

Tetra Tech EM Inc. (Tetra Tech) completed a site investigation at the Pesticide Mixing Area (PMA) of the former Kilauea Sugar Company Ltd. Mill, located along Aalona Street and Oka Street in Kilauea, on the Island of Kauai (the site). The site was formerly part of a sugarcane mill that operated from approximately 1877 to 1972. The site currently has 18 different properties in a residential setting composed predominantly of single-family homes. The Hawaii Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Office developed the scope of work and directed the site investigation. This Site Investigation Report presents the activities and findings related to the site investigation and supplemental activities related to an updated evaluation of environmental hazards and preliminary identification of potential action alternatives.

The site investigation was to further characterize and delineate the extent and magnitude of contaminants of potential concern (COPC) associated with the portion of the site defined as the Core PMA. Previous Sampling of Opportunity (SOO) done by the HEER Office in August and December 2010 and March 2011 indicated that the Core PMA was predominantly composed of these three properties: 2430A Oka Street (the Old Mill LLC property), 4277 Aalona Street (the Thompson property), and 4275 Aalona Street (the Foley property). The analytical results from these three sampling events indicated that soils in certain areas of the site, including the Core PMA, were impacted with several COPC that exceeded the applicable regulatory action levels. The site investigation focused on delineating the vertical and horizontal extent of identified COPC in and next to the Core PMA.

The field activities for the site investigation occurred in July and August 2011. During the course of the site investigation, 96 soil borings were advanced throughout the 26 decision units (DU) that were delineated at the site. The DUs were grouped into five distinct site areas designated Areas 1 through 5, as follows:

- Area 1 – Perimeter of Core PMA (DU1 through DU9);
- Area 2 – Core PMA (DU10 through DU17) and West Drainage Outfall (DU18 and DU19);
- Area 3 – Potentially Impacted Exposed Surface Soils – Not Previously Sampled (all on the Old Mill LLC property [DU21 through DU23]);
- Area 4 – Surrounding Properties (residential properties across Oka Street from the Old Mill LLC property [DU24 and DU25]); and,
- Area 5 – Hawaii Housing Authority Debris and Trash Pit (DU26 and DU27).

Tetra Tech collected 118 soil samples from the 26 DUs. The samples were submitted for analysis of COPC that were grouped into four categories: primary COPC, full PMA COPC, waste categorization COPC, and other COPC. The specific COPC selected for analysis depended upon the DU and the layer from which the sample was collected.

The analytical results indicated that there were several soil samples with one or more COPC that exceeded the applicable HEER Office Tier I Environmental Action Levels (EALs). Specifically, the soil samples from 23 of the 26 DUs had at least one COPC that exceed the applicable HEER Office Tier I EALs. The only DUs without any COPC exceedances were DU6, DU7, and DU9. Toxicity equivalence (TEQ) dioxins and arsenic (including total arsenic and bioaccessible arsenic) were the two most prevalent COPC with exceedances. The analytical results from the site investigation confirmed that the Core PMA, as initially identified by the HEER Office during the SOO samplings, is composed of the Old Mill LLC property (Drainage Swale portion of the property), the Thompson property, and the Foley property. The Core PMA includes DU10 to DU17 in Area 2, with DU10 exhibiting the most significant COPC impact.

Tetra Tech prepared an updated environmental hazard evaluation (EHE) using the site investigation analytical data. The updated EHE indicated that there are direct exposure and gross contamination soil hazards associated with the impacted soil identified at the site. Potential vapor intrusion, terrestrial ecology through runoff, and leaching soil hazards were eliminated for the site, based upon site conditions.

As part of the updated EHE, a focused evaluation was conducted for two selected targeted contaminants of concern (TCOC): TEQ dioxins and arsenic. These two contaminants were selected as the TCOC for the evaluation, because they were the primary drivers for potential human health risks, and because they were the two most prevalent COPC at the site. The HEER Office has also performed numerous evaluations of these two COPC at other agricultural sites and developed specific Tier II EALs for TEQ dioxins and arsenic. During this investigation, the degree of impacts for the TCOC in each DU was assessed with respect to the applicable HEER Office Tier II EAL Risk Categories A through D, with the following general findings:

- In Area 2, the readily accessible soil (0-2 feet bgs) in DU10 through DU17 was identified to be moderately to heavily impacted, and thereby classified as Category C and D. These findings warrant further action in order to mitigate exposure pathways to the impacted soil identified in DU10 through DU17.
- In Area 3, the readily accessible soil (0-2 feet bgs) in DU22, DU23, and the portion of DU21 along Aalona Street was identified by extrapolation using cross-sections to be moderately to heavily impacted (below the sampled depth of 0-0.5 feet bgs) and thereby classified as Category C and D.

  However, it is noted that the 0-0.5 foot bgs depth interval (Layer A) in all three DUs was classified as Category B based upon the sample analytical data. The impacted soil in these DUs will likely be managed with an Environmental Hazard Management Plan (EHMP), rather than remedial action based upon use and accessibility.
- The readily accessible soil (0-2 feet bgs) in Areas 1, 4, and 5, and the West Drainage Outfall portion of Area 2 was identified to be only minimally impacted, and thereby classified as Category B.

PENDING ACTIONS BASED UPON SITE INVESTIGATION

- The HEER Office has proposed to implement an Immediate Remedial Action at the Core PMA (Thompson property, Foley property, and Old Mill LLC property [drainage swale portion and abutting gravel parking areas only]) based on their review and evaluation of the site investigation findings.

  The immediate remedial action will focus on mitigating exposure pathways to the TCOC-impacted readily accessible soil (0-2 feet bgs) in DU10 through DU17, and managing potential exposure pathways related to DU21 through DU23.

- Additional actions related to the immediate remedial response will include the following:
  - A fact sheet will be prepared that summarizes the key findings of the site investigation in a user-friendly format. The fact sheet will be sent to residents at the site neighborhood, including all properties where samples were collected.
  - A detailed letter will be prepared and sent to each of the three properties to be included in the proposed immediate remedial action (Thompson, Foley, and Old Mill LLC properties). The letter will identify the site-specific findings for each of the properties and will discuss the proposed immediate remedial actions that will be conducted.
  - Property-specific EHMPs will be prepared for any property or area at the site with residual contaminated or impacted soils. The EHMPs will outline future land use guidelines and restrictions, including applicable engineering controls and institutional controls. The EHMPs should be updated as site conditions change, including after the immediate remedial action is completed.
  - The Thompson, Foley, and Old Mill LLC properties will be subject to deed restrictions, environmental covenants, and implementation of property-specific EHMPs.

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Acronyms and Abbreviations List

%	Percent
°C	Degree Celsius
ASTM	ASTM International
BMP	Best management practice
bgs	Below ground surface
COPC	Contaminant of potential concern
DEI	Donaldson Enterprises, Inc.
DQO	Data quality objective
DRO	Diesel range organics
DU	Decision unit
EAL	HEER Office Environmental Action Levels
EDR	Environmental Data Resources, Inc.
EHE	Environmental hazard evaluation
EHMP	Environmental Hazard Management Plan
EPA	United States Environmental Protection Agency
FE	Fundamental error
FEMA	Federal Emergency Management Agency
Geotek	Geotek Hawaii, Inc.
GPS	Global positioning system
GSE	Grouping and segregation error
HAR	Hawaii Administrative Rules
HDOH	State of Hawaii Department of Health
HEER	Hazard Evaluation and Emergency Response
HHA	Hawaii Housing Authority
ID	Identification
IDW	Investigation-derived waste
KBV	Kauai Beach Villas
KDP	Kauai Department of Planning
KDPW	Kauai Department of Public Works
kg	Kilogram
KKSC	Kauai Kilauea Sugar Company
KSNB	Kilauea Sugar Natural Bridges
KSPMA	Kilauea Sugar Pesticide Mixing Area
LCS	Laboratory control sample

mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
MS	Matrix spike
MSD	Matrix spike duplicate
msl	Mean sea level
NA	Not applicable
NAVFAC	Naval Facilities Engineering Command
ND	Not detected
NE	Not established
NELAC	National Environmental Laboratory Accreditation Conference
ng/kg	Nanograms per kilogram
OSHA	Occupational Safety and Health Administration
PARCC	Precision, accuracy, representativeness, comparability, and completeness
PBET	Physiologically-based extraction test
PCB	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Polychlorinated dibenzofurans
PCS	Pacific Commercial Services LLC
PID	Photoionization detector
PMA	Pesticide Mixing Area
PMAK	
ppm	Parts per million
ppt	Parts per trillion
PVT	PVT Land Company, Ltd.
QA	Quality assurance
QC	Quality control
RCRA	Resource Conservation and Recovery Act
ROW	Right-of-way
RPD	Relative percent difference
RRO	Residual range organics
RSD	Relative standard deviation
SAP	Sampling and Analysis Plan
SD	Standard deviation
SDG	Sample delivery group
SDWB	Safe Drinking Water Branch
SHWB	Solid and Hazardous Waste Branch
SOO	Sampling of Opportunity
SVOC	Semi-volatile organic compounds
TBD	To be determined

TCLP	Toxicity characteristic leaching procedure
TCOC	Targeted contaminants of concern
TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
Tetra Tech	Tetra Tech EM Inc.
TEF	Toxicity equivalence factors
TEQ	Toxicity equivalence
TGM	Technical Guidance Manual
TMK	Tax map key
TPH	Total petroleum hydrocarbons
UECA	Universal Environmental Covenant Act
UIC	Underground injection control
USGS	United States Geological Survey
VOC	Volatile organic compounds
WHO	World Health Organization

1 Project Introduction

This section provides an overview of the site investigation conducted at the Pesticide Mixing Area (PMA) of the former Kilauea Sugar Company Ltd. Mill, along Aalona Street and Oka Street in Kilauea, on the Island of Kauai (the site). This Site Investigation Report presents the activities and findings related to the site investigation and supplemental activities related to an updated evaluation of environmental hazards and preliminary identification of potential action alternatives.

1.1 Overview

Tetra Tech EM Inc. (Tetra Tech) was tasked by the Hawaii Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Office to perform a site investigation of the PMA. In May 2010, the HEER Office conducted historical records reviews to evaluate historical use and ownership of the site. This review was conducted as a part of ongoing site reviews conducted by the HEER Office. During this review, the HEER Office determined that the site was formerly part of the Kilauea Sugar Company, Ltd. Mill from approximately 1877 to 1972. The HEER Office interviewed knowledgeable personnel about the mill operations and site history. The HEER Office determined that portions of the site were used for pesticide storage, pesticide mixing, and seed dipping. Based on the findings from the records review and interviews, the HEER Office determined that additional investigation was warranted (HEER Office 2011f).

In August 2010, December 2010, and March 2011, the HEER Office conducted soil sampling at the site as part of their Sampling of Opportunity (SOO) program to provide a preliminary evaluation of potential impacts from historical site operations. The HEER Office collected 18 surface soil samples (0-0.5 foot below ground surface [bgs]) from various locations throughout the site. The analytical results from these three sampling events indicated that soils in certain areas of the site were impacted with several contaminants of potential concern (COPC) related to historical pesticide mixing activities that exceeded the applicable regulatory action levels (HEER Office 2011f). Based on these findings, the HEER Office contracted Tetra Tech to develop the technical approach for a site investigation to further delineate the extent and magnitude of identified COPC at the site. Tetra Tech developed a scope of work for the site investigation that was fully detailed in a Sampling and Analysis Plan (SAP) (Tetra Tech 2011). The HEER Office reviewed and approved the SAP in July 2011.

In March and April 2011, the HEER Office conducted public outreach activities with the Kilauea community, including the site residents and neighborhood, the greater Kilauea community, and several Hawaii State and County of Kauai government agencies. The focus of these activities was to provide information related to the previous soil samplings and proposed site investigation.

1.2 Project Goals

Based upon multiple discussions and meetings with the HEER Office, the project goals for the site investigation were to support:

- **Protection of human health and the environment**
    - Due to the confirmed presence of impacted soil at the site, the primary project goal was to ensure protection of human health and the environment through the determination of nature and extent of contamination and evaluation of environmental hazards at the site. The site investigation was designed to generate sufficient data to facilitate the development and assessment of several action alternatives. Subsequently, one of the action alternatives may be selected and implemented in order to reduce and/or eliminate exposure pathways to the impacted soil identified at the site.
- **To address resident and neighborhood concerns**
    - Due to the site being primarily used for residential purposes, there were considerable concerns for residents and property owners within the site boundaries and within the general vicinity/neighborhood of the site. The site investigation was designed to generate sufficient data to determine if the impacted soil is localized within previously identified areas or if it extends beyond those areas.
- **To address community concerns**
    - Due to the specific nature and history of the site, there were considerable community concerns related to the confirmed presence of impacted soil at the site. Several Hawaii State and County of Kauai government agencies, elected officials, and their corresponding stakeholders have expressed interest in the scope and status of the site investigation.

1.3 Purpose of the Site Investigation

The site investigation was to further characterize and delineate the extent and magnitude of COPC associated with the area defined as the core pesticide mixing area (Core PMA). The Core PMA is the area where the pesticide mixing operations were concentrated, and where the highest concentrations of COPC were identified during the HEER Office's three previous samplings (see Section 3.5 for further details). The site investigation focused on delineating the vertical and horizontal extent of identified COPC in and next to the Core PMA.

1.4 Scope of Work

The scope of work for the site investigation included:

- Site reconnaissance
- Oversight of subsurface utility clearance at sampling locations
- Delineate 26 unique decision units (DUs)
- Advance 96 soil borings throughout the 26 DUs
- Collect 118 soil samples from the 26 DUs
- Analyze samples and compare results to regulatory screening criteria

- Further characterize the nature and extent of contamination at the site
- Prepare an updated environmental hazard evaluation (updated EHE)
- Identify various applicable action alternatives
- Develop conclusions and recommendations for the site based on findings

1.5 Quality Objectives

Data quality objectives (DQOs) for the site investigation were developed during the project planning process and were included in the SAP. The complete DQOs are in Section 4.

2 Project Background

This section provides an overview of the general characteristics of the site and vicinity, historical land use, current land use, and environmental setting. The general characteristics of the site were determined using information provided by the HEER Office, visual observations made during the site reconnaissance, and the various supplemental reports provided by Environmental Data Resources, Inc. (EDR) (EDR 2011). Copies of the EDR supplemental reports are in Attachments A, B, and C. Historical aerial photographs provided by the HEER Office are in Attachment D. Historical land title records for the site properties provided by the HEER Office are in Attachment E.

2.1 Site Description

The site is along Aalona Street and Oka Street in Kilauea, on the northern coast of the Island of Kauai (see Figure 1). The site is accessed by Kilauea Road to Oka Street.

The site consists of 18 properties (see Figures 2 and 3) and is composed predominantly of single-family homes. The site includes a multi-unit apartment facility (managed by the Hawaii Housing Authority [HHA]), a private school and daycare facility, and two commercial properties. The 18 properties at the site occupy a combined area of 4.12 acres. According to the County of Kauai Department of Planning website, the site is zoned for residential communities (Kauai Department of Planning [KDP] 2011). Table 1 has detailed property information, including tax map key (TMK), physical address, primary owner, acreage, and usage.

Table 1 – Site Property Information

TMK	Address	Primary Owner	Area (Acres)	Property Usage
452008056	4264 Ala Muku Pl	Hawaii Housing Authority	1.00271	Apartment Facility
452014007	2414 Oka St	Crain, Kirsten A K – Natural Bridges School	0.13691	School/Daycare
452014008	2404 Oka St	Crain, Kirsten A K – Natural Bridges School	0.14246	School/Daycare
452014042	4295 Aalona St	Sansevere, Thomas G	0.15198	Single Family Home
452014043	2425 Oka St	Hadley, Ronald C	0.15301	Single Family Home
452014048	4282 Aalona St	Grace Paul Trust	0.1301	Single Family Home
452014049	2430 A Oka St	Old Mill LLC	0.48749	Commercial
452014050	2460 Oka St	North Shore Health Center	0.25255	Commercial
452014051	4278 Aalona St	Clarion, Nida S	0.12567	Single Family Home
452014052	4274 Aalona St	Johnson, Collette M	0.13236	Single Family Home
452014053	4276 Aalona St	Howard, Vincent C	0.11883	Single Family Home
452014054	4272 Aalona St	Deforge, Brigitte S	0.23089	Single Family Home
452014055	4270 Aalona St	Cooper, Sheila	0.18537	Single Family Home
452014056	4268 Aalona St	Cudiamat, Adriano A	0.16106	Single Family Home
452014057	4271 Aalona St	Owens, Julia D	0.19176	Single Family Home
452014058	4273 Aalona St	Ortal Willy S and Ederlina O Trust	0.19376	Single Family Home
452014059	4275 Aalona St	Foley, Michael E	0.17741	Single Family Home
452014060	4277 Aalona St	Thompson, Lisa A	0.1483	Single Family Home
SOURCE: Kauai Real Property and Tax Assessment Office Website 2011				

Based upon available information collected during the project planning process, and confirmed by this site investigation, the Core PMA is composed predominantly of three properties:

- 2430 A Oka Street, Old Mill LLC Property
- 4277 Aalona Street, Thompson Property
- 4275 Aalona Street, Foley Property

To the north, the site is bordered by residential properties, beyond which is Keneke Street. To the south, the site is bordered by Oka Street, beyond which are residential properties. To the east, the site is bordered by vacant, undeveloped land and residential properties. To the west, the site is bordered by residential and commercial properties, beyond which is Kilauea Road.

2.2 Historic Land Use

The history of the site and vicinity was researched by the HEER Office and Tetra Tech through Sanborn Fire Insurance Maps, historical aerial photographs, property ownership records, and interviews with former mill workers and Kilauea historians. This research indicated that the site was formerly part of the Kilauea Sugar Company Ltd. Mill that operated from approximately 1877 to 1972. The mill was started by Mr. James Ross and Mr. E.P. Adams and was closed by C. Brewer & Co. (see Attachments A-E).

Research and Sanborn Fire Insurance Map overlays on current tax maps (showing TMK parcels) revealed that portions of the site were used for pesticide storage, pesticide mixing, and seed dipping (see Figure 4). Several potential environmental risks are associated with PMAs, including use and storage of herbicides, pesticides, and other hazardous materials; the potential spilling of these hazardous materials during mixing, loading, and transporting; and the disposal of these hazardous materials in burial trenches when mills are closed (HEER Office 2011f).

Based on extensive previous experience with oversight of other PMA assessments and cleanups throughout the state, the HEER Office determined that additional investigation was warranted.

2.3 Environmental Setting

2.3.1 Topography

The site location is shown on the 1996 United States Geological Survey (USGS) Analoha, Hawaii quadrangle topographic map. According to the contour lines on the map, the site is approximately 325 feet above mean sea level (msl), consistent with the EDR report that indicates the site is located at 320 feet above msl. The general topographic gradient in the area decreases to the north, east, and west toward the Pacific Ocean (EDR 2011).

2.3.2 Wetlands and Surface Water

No wetlands or surface water bodies were observed on the 1996 USGS topographic map. The closest surface water body is Kilauea Stream, approximately 0.3 mile west of the site. The Pacific Ocean is approximately 1 mile north of the site. Two unnamed, manmade drainage features (drainage outfalls) are near the site. The West Drainage Outfall is approximately 250 feet west and downgradient of the site, and ultimately discharges to the Pacific Ocean at Secret Beach. The east drainage outfall is approximately 500 feet east and upgradient of the site, and discharges to the Pacific Ocean. According to the Federal Emergency Management Agency (FEMA) Flood Zone Map, Panel Numbers 150002, the site is not in a flood zone (EDR 2011).

2.3.3 Soil Lithology

According to the EDR report, the United States Department of Agriculture's Soil Conservation Service describes the subsurface soil at the site as part of the Lihue series. The near surface stratum (less than 12 inches bgs) and the next stratum (more than 12 and less than 60 inches bgs) are characterized as silty clay. The Lihue series soils have moderate infiltration rates, are moderately deep to deep, and have moderately coarse textures. The Lihue series soils are classified as moderately well to well drained, and have an intermediate water holding capacity. The Lihue series soils do not meet the requirements for hydric soil (EDR 2011).

During this investigation, the site soils were observed to consist of silty clay, silty clay with gravel, sandy clay, imported fill material, and gravel.

2.3.4 Groundwater

According to "Aquifer Identification and Classification for the Island of Kauai" (Mink and Lau 1992), two aquifers underlie the site. Both the upper and lower aquifers are in the Kilauea Aquifer System of the Lihue Aquifer Sector. The upper aquifer is basal and has contact with seawater, is unconfined, and is in flank lithology. The upper aquifer has potential use for drinking water, but is not currently used. The water in the upper aquifer is considered fresh with less than 250 milligrams per liter (mg/l) of chloride, is irreplaceable, and has a high vulnerability to contamination. The lower aquifer is basal and has contact with seawater, is confined by impermeable or poorly permeable foundations, and is in dike lithology. The lower aquifer is currently used for drinking water. The water in the lower aquifer is considered fresh with less than 250 mg/l of chloride, is irreplaceable, and has a low vulnerability to contamination (Mink and Lau 1992).

The estimated depth to groundwater in the lower aquifer for the general site region is approximately 200-400 feet bgs depending on the specific location and elevation, based on information provided by the County of Kauai Department of Engineering and the USGS. No site-specific depth to groundwater data was provided or available. Based on topography, the inferred groundwater flow direction is expected to be to the north. The local gradient and groundwater flow direction near the site may be influenced naturally by zones of higher or lower permeability, nearby streams or wetlands, or nearby wells. Information available in the EDR report and other available historical references did not indicate direction of groundwater flow near the site.

Groundwater was not encountered in any of the soil borings to approximately 10 feet bgs in this investigation.

2.3.5 Drinking Water Sources

The site is on the seaward side of the underground injection control (UIC) line. The UIC line was established by the HDOH Safe Drinking Water Branch (SDWB) to protect groundwater resources. On April 21, 2011, Tetra Tech contacted a representative from the HDOH SDWB to confirm the location of the site with reference to the UIC line. Mr. Norris Uehara confirmed that the site was on the seaward side of the UIC line. Groundwater inland of the UIC line is considered a potential drinking water source. Groundwater seaward of the UIC line is considered as non-potable and saline. Injection wells are prohibited inland of the UIC line (HDOH SDWB 2011).

3 Previous Sampling Activities – August 2010 through March 2011

This section provides an overview of the three previous samplings at the site by the HEER Office under the SOO program and sampling at the HHA property debris pit by Kauai Environmental. This section includes a summary of the sample results and an overview of the preliminary EHE)

Although the HEER Office has not prepared a report for the work performed under the SOO program to date, the details of the three samplings, including sampling locations, protocols, and laboratory analytical reports, were provided to Tetra Tech. All HEER Office work was performed in accordance with the applicable SOO protocols and associated SAPs (HEER Office 2011f).

Table 2 presents a summary of the analytical data from the three previous HEER Office samplings. The DU locations are on Figure 5.

Table 3 presents a summary of the analytical data from the Kauai Environmental sampling event conducted at the HHA property debris pit. The DU location is on Figure 5.

Table 2 – Summary of Soil Sample Results from Previous HEER Office Sampling Events

Primary COPC[1]	HDOH Tier I EAL (Unrestricted Use)[2]	HDOH Tier I EAL (Commercial / Industrial Use)[2]	KKSC-DU1	KKSC-DU2	KKSC-DU3	KKSC-DU4	KKSC-DU5	KKSC-DU6[3]	KKSC-DU7[3]	KKSC-DU8[3]	KSPMA-DU1	KSPMA-DU2	KSPMA-DU3	KSPMA-DU4	KSPMA-DU5	KSPMA-DU6	KSPMA-DU7	KSPMA-DU8	KSNB-DU1	KSNB-DU2
Sample Date			8.19.10	8.19.10	8.19.10	8.19.10	8.18.10	8.18.10	8.18.10	8.18.10	12.15.10	12.15.10	12.15.10	12.15.10	12.16.10	12.15.10	12.16.10	12.16.10	3.5.11	3.5.11
Depth Interval (' bgs)			0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Soil Analysis (ng/kg)																				
TEQ DIOXINS	240	1500	18	110	299	143	930	817	1070	879	170	94	87	55	140	**1700**	**2500**	650	17	125
Soil Analysis (mg/kg)																				
TOTAL ARSENIC	24	24	ND [<29]	ND [<30]	**100**	**44[a]**	**180[a]**	**520[a]**	**770**	**430[a]**	19.8	**93.9**	**33.8**	12.5	**39.1**	**1890**	**3760**	**317**	13.3	19.7
BIOACCESSIBLE ARSENIC	23	95	NA	NA	18.1	NA	NA	NA	**307**	NA	NA	9.98	4.6	NA	7.95	**786**	**1870**	**69.6**	NA	NA
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	NA	6.56	NA	NA	NA	18	NA	NA	4.27	4.88	NA	5.74	24.8	27.1	9.9	NA	NA
TOTAL ARSENIC (250 µm)	NE	NE	NA	NA	276	NA	NA	NA	1700	NA	NA	234	94.2	NA	138	3170	6890	703	NA	NA
MERCURY	4.7	61	0.328	0.28	1.44	0.467	5.94	15.4	28.2	45	0.569	0.969	0.776	0.416	1.12	18.4	13.8	11.1	NA	NA
LEAD	200	800	17	15	43	35	680	130	160	130	32.1	84	65.5	21	125	288	420	313	NA	NA
PENTACHLOROPHENOL	3	5	ND [<0.05]	0.26	0.11	0.093	0.3	0.05	0.44	0.28	ND [<0.05]	ND [<0.05]	ND [<0.05]	ND [<0.05]	ND [<0.05]	**3.61**	**7.13**	0.23	NA	NA

NOTES:

Red Text = Detected concentration exceeds the HDOH Tier I EAL for Unrestricted Use only.

Red Bold Text = Detected concentration exceeds the HDOH Tier I EALs for both Unrestricted and Commercial/Industrial Use.

mg/kg = Milligrams per kilogram (parts per million [ppm]) equivalent)

ng/kg = Nanograms per kilogram (parts per trillion [ppt] equivalent)

a = Detected concentration of total arsenic exceeded 20 ppm, but bioaccessible arsenic analysis was not conducted.

1 = This table only presents the soil sample results for the Primary COPC for the subject site investigation. This table does not include all of the analytical data for the other COPC categories.

2 = Fall 2011 Revised Tier I EALs

3 = Triplicate sample

KKSC = Kauai Kilauea Sugar Company

KSPMA = Kilauea Sugar Pesticide Mixing Area

KSNB = Kilauea Sugar Natural Bridges

ND = Not detected at or above the method detection limit shown in brackets

NA = Not analyzed

NE = Not established

Table 3 – Summary of Kauai Environmental HHA Property Debris Pit Sampling Results

COPC[1]	HDOH Tier I EAL (Unrestricted Use)[2]	HDOH Tier I EAL (Commercial / Industrial Use)[2]	KBV -01[3]
Sample Date			1.26.11
Depth Interval (' bgs)			4.0-6.0
Soil Analysis (ng/kg)			
TEQ DIOXINS	240	1500	NA
Soil Analysis (mg/kg)			
TOTAL ARSENIC	24	24	**950**[a]
BIOACCESSIBLE ARSENIC	23	95	NA
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA
TOTAL ARSENIC (250 µm)	NE	NE	NA
MERCURY	4.7	61	3.6
LEAD	200	800	240
PENTACHLOROPHENOL	3	5	**6.4**
TPH-DRO	500	500	ND [<20]
TPH-RRO	500	1000	ND [<40]
PCBs - AROCLOR 1016 - 1260	1.1	7.4	ND [<0.5]
BARIUM	1000	2500	420
CADMIUM	14	120	3.3
CHROMIUM	1100	1100	42
SELENIUM	78	1000	ND [<20]
SILVER	78	1000	ND [<20]
4-NITROPHENOL	NE	NE	1700
PHENANTHRENE	69	69	0.32
FLUORANTHENE	40	40	0.42
PYRENE	56	56	0.53
BENZO(A)ANTHRACENE	1.5	13	0.41
CHRYSENE	14	14	0.84
BENZO(B)FLUORANTHENE	1.5	12	0.2
BENZO(K)FLUORANTHENE	15	40	0.41

NOTES:
Red Text = Detected concentration exceeds the HDOH Tier I EAL for Unrestricted Use only.
Red Bold Text = Detected concentration exceeds the HDOH Tier I EALs for both Unrestricted and Commercial/Industrial Use.
mg/kg = Milligrams per kilogram (parts per million [ppm]) equivalent)
ng/kg = Nanograms per kilogram (parts per trillion [ppt] equivalent)
a = Detected concentration of total arsenic exceeded 20 ppm, but bioaccessible arsenic analysis was not conducted.
1 = All other analyses for Organochlorine Pesticides 8081 and SVOC 8270 are ND.
2 = Fall 2011 Revised Tier I EALs
3 = This sample was collected by Kauai Environmental.
KBV = Kauai Beach Villas
NA = Not analyzed
ND = Not detected at or above the method detection limit shown in brackets
NE = Not established

3.1 HEER Office August 2010 Sampling

In August 2010, the HEER Office conducted the first of three soil samplings. The first sampling was to assess the presence or absence of COPC in the surface soils at the site.

During this sampling, the HEER Office collected 8 multi-increment soil samples from 6 DUs (see Figure 5)—the HHA property (2 DUs), Foley property (2 DUs), and Thompson property (2 DUs). The HEER Office used a single naming scheme for both the DU and sample identification (ID). The DU/Sample ID naming scheme for this sampling event followed the following format:

A-B

Where:

A Specifies the site, (KKSC) Kauai Kilauea Sugar Company

B Specifies the DU

All samples were collected from 0-0.5 foot bgs, using a handheld drill or stainless steel trowel. These samples were submitted to Test America's laboratory in Aiea, Hawaii, for analysis of the following COPC:

- Total metals with United States Environmental Protection Agency (EPA) Method 6010 and 7471
- Bioaccessible arsenic with Physiologically Based Extraction Test (PBET)
- Organochlorine pesticides with EPA Method 8081
- Modified Pesticides Screen (Triazine Pesticides and Organophosphorus Pesticides) with EPA Method 8270
- Chlorinated herbicides with EPA Method 8151
- Toxicity equivalence (TEQ) Dioxins with EPA Method 8290
- Semivolatile organic compounds (SVOC) with EPA Method 8270
- Carbamate herbicides with EPA Method 8321

The results were compared with the HEER Office's Tier I Environmental Action Levels (EAL) for soils on both unrestricted use and commercial or industrial use sites, where potentially impacted groundwater is not a current or potential drinking water resource, and with surface water bodies located more than 150 meters from the site (HEER Office 2011b).

Laboratory analytical results indicated that COPC concentrations in six of the eight samples exceeded the applicable HEER Office Tier I EALs. Multiple COPC exceeded the applicable HEER Office Tier I EALs for the samples collected at the Thompson and Foley properties.

A summary of the analytical results is in Table 4 and the sample locations are shown on Figure 5.

Table 4 – HEER Office August 2010 Sample Summary

TMK/Property Info	DU/Sample ID	Number of Samples Collected	COPC Exceeding HEER Office Tier I EALs[1]	Sample Location
452008056	KKSC-DU1	1	None	North of Building B
HHA Property	KKSC-DU2	1	None	West of Building B
452014059 Foley Property	KKSC-DU3	1	TEQ Dioxins	Back Yard
			Total Arsenic (Note: Bioaccessible arsenic below Tier I EAL)	
	KKSC-DU4	1	**Total Arsenic**[2]	Front Yard
452014060 Thompson Property	KKSC-DU5	1	TEQ Dioxins	Front Yard
			Total Arsenic[2]	
			Mercury	
			Lead	
	KKSC-DU6	1	TEQ Dioxins	Side and Back Yards - Triplicate
			Total Arsenic[2]	
			Mercury	
	KKSC-DU7	1	TEQ Dioxins	Side and Back Yards - Triplicate
			Total Arsenic	
			Bioaccessible Arsenic	
			Mercury	
	KKSC-DU8	1	TEQ Dioxins	Side and Back Yards - Triplicate
			Total Arsenic[2]	
			Mercury	

NOTES:

Red Text = Detected concentration exceeds the HDOH Tier I EAL for Unrestricted Use only.

Red Bold Text = Detected concentration exceeds the HDOH Tier I EALs for both Unrestricted and Commercial/Industrial Use.

1 = Fall 2011 Revised Tier I EALs

2 = Detected concentration of total arsenic exceeded 20 ppm, but bioaccessible arsenic analysis was not conducted.

KKSC = Kauai Kilauea Sugar Company

Based on the findings from the August 2010 sampling, the HEER Office determined additional assessment and sampling would be necessary to further characterize identified impacts from historical site operations (HEER Office 2011f).

3.2 HEER Office December 2010 Sampling

In December 2010, the HEER Office conducted the second of three soil samplings. The second sampling was to further characterize the surface soils, based on the results of the August 2010 sampling (HEER Office 2011f).

During this sampling, the HEER Office collected eight multi-increment soil samples from eight DUs (see Figure 5). The eight DUs were: the Cudiamat property (1 DU); the Howard property (1 DU), the Clarion property (1 DU), the Owens property (1 DU), the North Shore Health Center property (1 DU), and the Old Mill LLC property (3 DUs). The HEER Office used a single naming scheme for both the DU and sample identification (ID). The DU/Sample ID naming scheme for this sampling event followed the following format:

A-B

Where:

A Specifies the site, (KSPMA) Kilauea Sugar Pesticide Mixing Area

B Specifies the DU

All samples were collected from 0-0.5 foot bgs, using a handheld drill or stainless steel trowel. These samples were submitted to Test America's laboratory in Aiea, Hawaii, for analysis of the following COPC:

- Total metals with EPA Method 6010 and 7471
- Bioaccessible arsenic with PBET
- Organochlorine pesticides with EPA Method 8081
- Modified Pesticides Screen (Triazine Pesticides and Organophosphorus Pesticides) with EPA Method 8270
- Chlorinated herbicides with EPA Method 8151
- TEQ dioxins with EPA Method 8290
- SVOC with EPA Method 8270
- Carbamate herbicides with EPA Method 8321

The results were compared with the HEER Office's Tier I EALs for soils on unrestricted use and commercial or industrial use sites, where potentially impacted groundwater is not a current or potential drinking water resource, and with surface water bodies more than 150 meters from the site (HEER Office 2011b).

Laboratory analytical results indicated that COPC concentrations for six of the eight soil samples exceeded the applicable Tier I EALs, including samples from: the Howard property, the Clarion property, the North Shore Health Center property, and the Old Mill LLC property.

A summary of the analytical results is in Table 5 and the sample locations are shown on Figure 5.

Table 5 – HEER Office December 2010 Sample Summary

TMK/Property Info	DU/Sample ID	Number of Samples	COPC Exceeding HEER Office Tier I EALs[1]	Sample Location
452014056 Cudiamat Property	KSPMA-DU1	1	None	Front and Side Yards
452014053 Howard Property	KSPMA-DU2	1	**Total Arsenic** (Note: Bioaccessible arsenic below Tier I EAL)	Front and Back Yards
452014051 Clarion Property	KSPMA-DU3	1	**Total Arsenic** (Note: Bioaccessible arsenic below Tier I EAL)	Front, Side, and Back Yards
452014057 Owens Property	KSPMA-DU4	1	None	Front, Side, and Back Yards
452014050 North Shore Health Center Property	KSPMA-DU5	1	**Total Arsenic** (Note: Bioaccessible arsenic below Tier I EAL)	Side Yard
452014049 Old Mill LLC Property	KSPMA-DU6	1	**TEQ Dioxins** **Total Arsenic** **Bioaccessible Arsenic**	North-Central Drainage Swale
	KSPMA-DU7	1	**TEQ Dioxins** **Total Arsenic** **Bioaccessible Arsenic** **Pentachlorophenol**	South-Central Drainage Swale
	KSPMA-DU8	1	**Total Arsenic** **Bioaccessible Arsenic**	Eastern Drainage Swale

NOTES:

Red Text = Detected concentration exceeds the HDOH Tier I EAL for Unrestricted Use only.

Red Bold Text = Detected concentration exceeds the HDOH Tier I EALs for both Unrestricted and Commercial/Industrial Use.

1 = Fall 2011 Revised Tier I EALs

KSPMA = Kilauea Sugar Pesticide Mixing Area

Based on the findings from the December 2010 sampling, the HEER Office determined additional assessment and sampling would be required to further characterize identified impacts from historical site operations (HEER Office 2011f). Specifically, the HEER Office was concerned with potential impacts to the Natural Bridges School (school and daycare facility) located directly adjacent to the Old Mill LLC property.

3.3 HEER Office March 2011 Sampling

In March 2011, the HEER Office conducted the third of three soil samplings. The third sampling was to further characterize the surface soils at the Natural Bridges School property (HEER Office 2011f).

During this sampling, the HEER Office collected two multi-increment soil samples from two DUs (see Figure 5) at the Natural Bridges School property. The HEER Office used a single naming scheme for both the DU and sample identification (ID). The DU/Sample ID naming scheme for this sampling event followed the following format:

A-B

Where:

A Specifies the site, (KSNB) Kilauea Sugar Natural Bridges

B Specifies the DU

All samples were collected from 0-0.5 foot bgs, using a handheld drill. The samples were submitted to Test America laboratory in Aiea, Hawaii, for analysis of the following COPC:

- Total arsenic with EPA Method 6010
- TEQ dioxins with EPA Method 8290

The results were compared with the HEER Office's Tier I EALs for soils on unrestricted use sites, where potentially impacted groundwater is not a current or potential drinking water resource, and with surface water bodies more than 150 meters from the site (HEER Office 2011b).

All COPC concentrations were below the applicable HEER Office Tier I EALs.

A summary of the analytical results is in Table 6 and the sample locations are shown on Figure 5.

Table 6 – HEER Office March 2011 Sample Summary

TMK/Property Info	DU/Sample ID	Number of Samples Collected	COPC Exceeding HEER Office Tier I EALs[1]	Sample Location
452014007 Natural Bridges School	KSNB-DU1	1	None	Playground Area
452014008 Natural Bridges School	KSNB-DU2	1	None	Front, Side, and Back Yards

NOTES:

1 = Fall 2011 Revised Tier I EALs

KSNB = Kilauea Sugar Natural Bridges

Based on the findings from the March 2011 sampling, the HEER Office recommended no further assessment or sampling was needed at the Natural Bridges School property (HEER Office 2011f).

3.4 Kauai Environmental HHA Property Debris Pit January 2011 Sampling

HHA contracted AECOM to do construction oversight of the installation of the new septic systems at their property in Kilauea on the Island of Kauai (TMK 452008056). During excavation for the septic tank and tile field at the HHA property, a debris and trash pit was identified. AECOM subcontracted Kauai Environmental to do limited soil sampling of the debris pit to assess potential contamination concerns. This work was not done by the HEER Office, or under the direction or oversight of the HEER Office. Kauai Environmental prepared a sampling summary memorandum dated February 7, 2011 and, a contaminated soil management work plan dated July 7, 2011 (Kauai Environmental 2011). This work plan included a revised version of the sampling summary memorandum. Additional information related to the HHA debris pit was in a summary memorandum prepared by Mr. Mark Sutterfield, technical consultant for the HEER Office, dated March 15, 2011 (Sutterfield 2011).

The debris pit was found in the northwest corner of the HHA property, running the entire length of Building B. Refer to Figure 3 for the location of Building B and Figure 5 for location of the debris pit. The materials identified in the pit included: wire, glass, yellow and red powder, metal, and electrical equipment. The debris was buried approximately 4-6 feet bgs. The highest concentration of debris was along the northwestern portion of the pit, and visual signs of debris decreased when moving east towards Building B (Kauai Environmental 2011 and Sutterfield 2011).

Some soils in in the pit were noted to be black, yellow or red. In January 2011, Kauai Environmental collected one 10-point composite soil sample (sample ID: KBV-01) from the remaining debris in the northwestern sidewall of the pit. The soil sample was submitted to ESN Pacific's laboratory in Honolulu, Hawaii, for analysis of the following COPC:

- Total petroleum hydrocarbons-diesel range organics (TPH-DRO) and total petroleum hydrocarbons-residual range organics (TPH-RRO) with EPA Method 8015
- Polychlorinated biphenyls (PCB) with EPA Method 8082

- Organochlorine pesticides with EPA Method 8081
- Resource Conservation and Recovery Act (RCRA) 8 metals with EPA Method 6010 and 7471
- SVOC with EPA Method 8260

Total arsenic, lead, and pentachlorophenol concentrations exceeded the applicable HEER Office Tier I EALs. Although an elevated concentration of 4-nitrophenol (1,700 milligrams per kilogram [mg/kg]) was detected, the HEER Office has not established a Tier I EAL for 4-nitrophenol. The results for selenium and silver were reported as not detected (ND); however, the laboratory method detection limits for both selenium and silver were greater than the Tier I EALs for unrestricted use (Kauai Environmental 2011).

A summary of the analytical results is in Table 7 and the sample locations are shown on Figure 5.

Table 7 – HHA Property Debris Pit January 2011 Sample Information

TMK/Property Info	DU/Sample ID	Number of Samples Collected	COPC Exceeding HEER Office Tier I EALs[1]	Sample Location
452008056 HHA Property	KBV-01	1	**Total Arsenic**[2]	Debris Pit
			Lead	
			Pentachlorophenol	

NOTES:
Red Text = Detected concentration exceeds the HDOH Tier I EAL for Unrestricted Use only.
Red Bold Text = Detected concentration exceeds the HDOH Tier I EALs for both Unrestricted and Commercial/Industrial Use.
1 = Fall 2011 Revised Tier I EALs
2 = Detected concentration of total arsenic exceeded 20 ppm, but bioaccessible arsenic analysis was not conducted.
KBV = Kauai Beach Villas

The HEER Office made several recommendations to HHA regarding proper procedures and protocols for site activities, including excavation, stockpiling, best management practices (BMPs) related to contaminated soil, and capping with clean fill material. Kauai Environmental has reportedly been contracted by HHA to further assess the impacted soil and determine proper waste management options (Sutterfield 2011). According to the HEER Office, on July 7, 2011, Kauai Environmental submitted a work plan regarding the pending soil management activities.

Based on the findings of the Kauai Environmental HHA property debris pit sampling, the HEER Office determined the following:

- The data suggests that the abutting residential properties to the west-northwest, the Foley property (TMK 452008059), and the Ortal property (TMK 452014058), may be impacted with debris and trash.
- There is some evidence that contamination from a former pesticide storage facility may be buried in the extreme southwest portion of the HHA property, near the Drainage Swale. No soil has been sampled in this area. Several soil borings or test pits will be required to determine the nature and extent of

contamination in this area. Samples should be collected on the HHA property, the Foley property, and Ortal property to address this data gap (Sutterfield 2011).

The above HDOH recommendations were included in the subject site investigation in this report.

3.5 Summary of Previous Sampling Activities

This section provides a summary of the three HEER Office sampling events and the HHA property debris pit sampling event.

3.5.1 Identified Contaminants of Potential Concern

The five most prevalent COPC for the site are TEQ dioxins, arsenic (including total arsenic and bioaccessible arsenic), mercury, pentachlorophenol, and lead. Of these COPC, TEQ dioxins and arsenic exhibited the greatest degree of impact.

3.5.2 Extent of Contamination

The impacted surface soil is primarily located on the Thompson property, the Foley property, and in the Drainage Swale of the Old Mill LLC property. As previously indicated these properties are referred to as the "Core PMA." No soil samples were collected at depths greater than 0.5 feet bgs during the three HEER Office sampling events. As a result, the vertical extent of impacted soil at the site is unknown.

The identified impacted subsurface soil is limited to the HHA property debris pit, as this was the only portion of the site where subsurface soil samples were collected. No soil samples were collected from at depths other than 4-6 feet bgs during the HHA property debris pit sampling event. As a result, the vertical extent of impacted soil at the HHA property debris pit is unknown.

3.5.3 Possible Sources of Contamination

The impacted surface soil at the site is likely the result of on-site activities from former PMA operations. Based on available information, these operations or activities included: the use and storage of herbicides, pesticides, and other hazardous materials; the potential spillage of these hazardous materials during mixing, loading, and transporting activities; and the illegal disposal of these hazardous materials when mill operations ceased. Historical evidence indicates that all of these activities likely occurred at the site.

The impacted subsurface soil in the HHA property debris pit is likely the result of disposal of these hazardous materials when mill operations ceased.

3.5.4 Core PMA Findings

Old Mill LLC Property:

See Figure 3 for property location and Figure 5 for DU locations.

- Soils within the Drainage Swale portion of the Old Mill LLC property exhibited the greatest degree of impact, compared to the other two Core PMA properties.
- The highest TEQ dioxins concentration (2,500 nanograms per kilogram [ng/kg], equivalent to parts per trillion [ppt]); total arsenic concentration (6,890 mg/kg); bioaccessible arsenic concentration (1,870

mg/kg); and pentachlorophenol concentration (7.13 mg/kg) were detected in DU/Sample ID: KSMPA-DU7. This DU is located in the south-central portion of the Drainage Swale (hereinafter the "Drainage Swale") on the Old Mill LLC property, and near the commercial use building. All of these detected concentrations exceeded the applicable HEER Office Tier I EALs. This DU exhibited the greatest degree of impact of any sampling location at the site.

- The next highest TEQ dioxins concentration (1,700 ng/kg); total arsenic concentration (3,170 mg/kg); bioaccessible arsenic concentration (786 mg/kg); and pentachlorophenol concentration (3.61 mg/kg) were detected in DU/Sample ID: KSPMA-DU6. This DU is located in the north-central portion of the Drainage Swale on the Old Mill LLC property, and near the Thompson property. All of these detected concentrations exceeded the applicable HEER Office Tier I EALs. This DU exhibited the next most degree of impact of any sampling location at the site.
- The sample collected from the southeastern portion of the Drainage Swale on the Old Mill LLC property (DU/Sample ID: KSPMA-DU8) had detected concentrations of TEQ dioxins (650 ng/kg); total arsenic (703 mg/kg); bioaccessible arsenic (69.6 mg/kg); mercury (11.1 mg/kg); and lead (313 mg/kg) that exceeded the applicable HEER Office Tier I EALs. The detected concentrations of COPC in this sample were lower than those from DU/Sample ID: KSPMA-DU6 and KSPMA-DU7.

Thompson Property:

See Figure 3 for property location and Figure 5 for DU locations.

- Soils at the Thompson property indicated the second greatest degree of impact, compared to the other two Core PMA properties.
- The four samples collected from the Thompson property (DU/Sample ID: KKSC-DU5 to KKSC-DU8) had detected concentrations of TEQ dioxins (range: 817 to 1,070 ng/kg), total arsenic (range: 180 to 1,700 mg/kg), and mercury (range: 5.94 to 45 mg/kg) exceed the applicable HEER Office Tier I EALs.
- DU/Sample ID: KKSC-DU5 had detected concentrations of lead (680 mg/kg) and DU/Sample ID: KKSC-DU7 had detected concentrations of bioaccessible arsenic (307 mg/kg) that exceeded the applicable HEER Office Tier I EALs.
- The highest mercury concentration at the site (45 mg/kg) was detected in DU/Sample ID: KKSC-DU8. This DU is located in the side and back yards of the Thompson property.
- The highest lead concentration at the site (680 mg/kg) was detected in DU/Sample ID: KKSC-DU5. This DU is located in the front yard of the Thompson property.

Foley Property:

See Figure 3 for property location and Figure 5 for DU locations.

- Soils at the Foley property indicated the least degree of impact, compared to the other two Core PMA properties.
- The two samples collected from the Foley property (DU/Sample ID: KKSC-DU3 to KKSC-DU4) had detected concentrations of total arsenic (276 mg/kg and 44 mg/kg, respectively) that exceeded the applicable HEER Office Tier I EALs.
- DU/Sample ID: KKSC-DU3 also had detected concentrations of TEQ dioxins (299 ng/kg) that exceeded the applicable HEER Office Tier I EAL.

The analytical data suggests that the greatest extent of impacted soil is in the Drainage Swale portion of the Old Mill LLC property, and that elevated concentrations are likely present underneath the commercial building at property. No sampling was conducted within or underneath the commercial building or the paved parking lot, since it is an active facility. These findings support that COPC concentrations are anticipated to decrease further from the Drainage Swale portion of the Old Mill LLC property.

3.5.5 HHA Property Findings

See Figure 3 for property location and Figure 5 for DU locations.

- None of the samples collected from the HHA property (DU/Sample IDs: KKSC-DU1 and KKSC-DU2) during the HEER Office August 2010 sampling event had detected concentrations of COPC exceed the applicable HEER Office Tier I EALs.
- In January 2011, a debris pit at the HHA property was identified by Kauai Environmental at approximately 4-6 feet bgs. The highest concentration of debris was located along the northwestern portion of the debris pit. The soil sample collected from the HHA property debris pit (DU/Sample ID: KBV-01) had detected concentrations of total arsenic, lead, and pentachlorophenol which exceed the applicable HEER Office Tier I EALs.

3.5.6 Other Area Findings

Howard Property, Clarion Property, and North Shore Health Center Property:

See Figure 3 for property locations and Figure 5 for DU locations.

- The sample collected from the Howard property (DU/Sample ID: KSPMA-DU2) had detected concentration of total arsenic exceed the applicable HEER Office Tier I EAL. However, the detected concentration of bioaccessible arsenic did not exceed the HEER Office Tier I EAL.

- The sample collected from the Clarion property (DU/Sample ID: KSPMA-DU3) had detected concentration of total arsenic exceed the applicable HEER Office Tier I EAL. However, the detected concentration of bioaccessible arsenic did not exceed the HEER Office Tier I EAL.
- The sample collected from the North Shore Health Center property (DU/Sample ID: KSPMA-DU5) had detected concentration of total arsenic exceed the applicable HEER Office Tier I EAL. However, the detected concentration of bioaccessible arsenic did not exceed the HEER Office Tier I EAL.
- These findings suggest that the Howard property, Clarion property, and North Shore Health Center property, have limited impacts from historic site activities.

Cudiamat Property, Owens Property, and Natural Bridges School Property:

See Figure 3 for property locations and Figure 5 for DU locations.

- None of the samples collected from the Cudiamat property, Owens property, or Natural Bridges School property during the three HEER Office sampling events had detected concentrations of COPC exceed the applicable HEER Office Tier I EALs.

3.6 Preliminary Environmental Hazard Evaluation

Tetra Tech conducted a preliminary environmental hazard evaluation (preliminary EHE) as part of the project planning process and it was included in the SAP. The preliminary EHE was conducted using the data from the HEER Office's three previous samplings (August 2010, December 2010, and March 2011). The preliminary EHE evaluated potential soil, groundwater, and soil gas hazards (Tetra Tech 2011).

Direct exposure, potential terrestrial ecology through runoff, and gross contamination soil hazards were identified at the site. No groundwater or soil gas data was available, as a result a quantitative evaluation of groundwater and soil gas contamination was not completed. However, based on available soil sample analytical results, site conditions, and leaching potential of the identified COPC, the potential environmental hazards for groundwater and soil gas were not considered significant. Refer to Section 4 of the SAP for additional details regarding the preliminary EHE (Tetra Tech 2011).

3.7 Evaluation of Targeted Contaminants of Concern for Previous Sampling Activities

After preparing the preliminary EHE, the findings and analytical data from the previous sampling activities were further evaluated. TEQ dioxins and arsenic (including total arsenic and bioaccessible arsenic) were selected as the targeted contaminants of concern (TCOC) for the focused evaluation, because they were the primary drivers for potential human health risks, and because they were the two most prevalent COPC at the site based on previous sampling activities. The HEER Office has conducted numerous evaluations of these two COPC at other agricultural sites and developed specific Tier II EALs for them. The HEER Office Tier II EALs are based on modifications to the EPA Regional Screening Levels that were used to develop the HEER Office Tier I EALs.

The term "dioxins" is used to refer to a family of chlorinated compounds with similar chemical structures and mechanisms of toxicity, referred to as congeners. The evaluation of risk to human health focuses on 17 specific congeners – seven (7) polychlorinated dibenzo-p-dioxins (PCDD) and (10) polychlorinated dibenzofurans (PCDF). Individual congeners are not equally toxic. The toxicity of specific congeners is assigned a value relative to the toxicity of 2,3,7,8-Tetrachlorodiobenzo-p-dioxin (TCDD), the most potent carcinogen of the 17 congeners evaluated. These values are referred to as toxicity equilavence factors (TEF). The reported concentration of an individual congener is multiplied by its respective TEF to produce a toxicity equilavence (TEQ) concentration. The TEQ concentrations for individual congeners are then added together to calculate a total TEQ dioxins concentration for the sample.

The TEQ dioxins concentrations cited throughout this report were all calculated using the TEFs developed by the World Health Organization (WHO) in 2005 (WHO 2005).

Bioaccessible arsenic data more accurately evaluates risks to human health than does total arsenic data. The HEER Office requested that the evaluation of the TCOC use both the total arsenic and bioaccessible arsenic data, because not all samples were analyzed for bioaccessible arsenic. When total arsenic and bioaccessible arsenic data were available for a given sample, the bioaccessible arsenic data was used. When bioaccessible arsenic data was unavailable, the total arsenic concentration was used to estimate the bioaccessible arsenic concentration. The bioaccessible arsenic concentration was estimated using 10 percent of the total arsenic concentration, as recommended by the HEER Office. Based on the small sample size, and the variability of the percent bioaccessible arsenic in the samples collected during the previous sampling activities at the site, it was not possible to apply a site-specific percentage (the bioaccessible percentage ranged from approximately 5% to 30%, with significant variability between DUs). Higher bioaccessible percentages were not necessarily correlated to significantly elevated total arsenic concentrations.

A focused evaluation of the TCOC was conducted to identify the degree of impact for the TCOC in each DU/DOH Sample ID from the previous sampling activities with respect to the applicable HEER Office Tier II EAL Risk Categories.

As defined by the HEER Office, and for subsequent discussions, the Tier II EAL Risk Categories are:

- A – Background
- B – Minimally impacted
- C – Moderately impacted
- D – Heavily impacted

The TCOC analytical results were compared to the HEER Office's Tier II EALs for soils on unrestricted use and commercial or industrial use sites (depending on current property use) (HEER Office 2011d and 2011e). The evaluation consisted of two separate steps, as follows:

- Step 1 – Identify HEER Office Tier II EAL risk categories for each sample for each TCOC (i.e., separate values for TEQ dioxins and arsenic).
- Step 2 – Identify highest impact Tier II EAL risk category for each sample for both TCOC.

  Example: If dioxin concentration of 150 ng/kg [Category B], and bioaccessible arsenic concentration of 1000 mg/kg [Category D], then the Tier II risk category for the DU is Category D.

3.7.1 Step 1 – Identify Tier II EAL Risk Categories for Each Sample for Each TCOC

As part of Step 1, the TCOC analytical results were compared to the HEER Office's Tier II EALs for soils on unrestricted use and commercial or industrial use sites (depending on current property use) (HEER Office 2011d and 2011e). In general, each sample had a two separate risk categories, one for TEQ dioxins and one for arsenic. If there was no TCOC analytical data available, the sample was not assigned a risk category. The findings from Step 1 are presented in Appendix H, which includes separate tables for TEQ Dioxins and arsenic.

3.7.2 Step 2 – Identify Highest Impact Tier II EAL Risk Categories for Each Sample

As part of Step 2, the information from Step 1 was used to identify the highest impact Tier II EAL risk category for each sample. The individual risk categories for TEQ dioxins and arsenic for a given sample were compared, and the highest impact risk category identified was assigned to that sample, to provide the most conservative approach.

The findings from Step 2 are presented on Figure 6, which shows each DU/Sample ID with respect to the Tier II EAL risk categories. This figure presents only the TCOC analytical data. The highest impact risk category identified among all samples for a given DU was the risk category selected for that DU in Figure 6 to present the most conservative scenario.

A summary of the findings from the focused evaluation is provided below.

3.7.3 TCOC at the Core PMA Properties

Old Mill LLC Property:

The Drainage Swale portion of the Old Mill LLC property consists of DU/Sample IDs: KSPMA-DU6 to KSPMAC-DU8.

- The findings from DU/Sample IDs KSPMA-DU6 and KSPMA-DU7 indicate that Category D TCOC-impacted soil is present from 0-0.5 feet bgs.
- The findings from DU/Sample ID KSPMA-DU8 indicate that Category C TCOC-impacted soil is present from 0-0.5 feet bgs.

Thompson Property:

The Thompson property consists of DU/Sample IDs KKSC-DU5 to KKSC-DU8.

- The findings from DU/Sample ID KKSC-DU7 indicate that Category D TCOC-impacted soil is present from 0-0.5 feet bgs.
- The findings from DU/Sample IDs KKSC-DU5, KKSC-DU6, and KKSC-DU8 indicate that Category C TCOC-impacted soil is present from 0-0.5 feet bgs.

Foley Property:

The Foley property consists of DU/Sample IDs KKSC-DU3 and KKSC-DU4.

- The findings from DU/Sample ID KKSC-DU3 indicate that Category C TCOC-impacted soil is present from 0-0.5 feet bgs.
- The findings from DU/Sample ID KKSC-DU4 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.

3.7.4 TCOC at the HHA Property

The HHA property consists of DU/Sample IDs: KKSC-DU1, KKSC-DU2, and KBV-01.

- The findings from DU/Sample ID KKSC-DU2 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.
- The findings from DU/Sample ID KKSC-DU1 indicate that Category A soil is present from 0-0.5 feet bgs.
- The findings from DU/Sample ID KBV-01 indicate that Category C TCOC-impacted soil is present from 4-6 feet bgs within the HHA property debris pit.

3.7.5 TCOC at the Remaining Properties

Cudiamat Property:

The Cudiamat property consists of DU/Sample ID KSPMA-DU1.

- The findings from DU/Sample ID KSPMA-DU1 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.

Howard Property:

The Howard property consists of DU/Sample ID KSPMA-DU2.

- The findings from DU/Sample ID KSPMA-DU2 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.

Clarion Property:

The Clarion property consists of DU/Sample ID KSPMA-DU3.

- The findings from DU/Sample ID KSPMA-DU3 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.

Owens Property:

The Owens property consists of DU/Sample ID KSPMA-DU4.

- The findings from DU/Sample ID KSPMA-DU4 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.

North Shore Health Center Property:

The North Shore Health Center property consists of DU/Sample ID KSPMA-DU5.

- The findings from DU/Sample ID KSPMA-DU5 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.

Natural Bridges School Property:

The Natural Bridges School property consists of DU/Sample IDs: KSNB-DU1 and KSNB-DU2.

- The findings from DU/Sample ID KSNB-DU1 indicate that Category A soil is present from 0-0.5 feet bgs.
- The findings from DU/Sample ID KSNB-DU2 indicate that Category B TCOC-impacted soil is present from 0-0.5 feet bgs.

4 Data Quality Objectives and Criteria

This section provides the DQOs that were developed during the project planning process and are included in the SAP (Tetra Tech 2011). The DQOs are qualitative and quantitative statements developed in conformance with the HEER Office nine-step DQO process as outlined in Section 3.2 of the HEER Office TGM (HEER Office 2011c). The DQOs clarify the study objectives, define the most appropriate data to collect and the conditions under which to collect the data, and specify tolerance limits on decision errors that will be used as the basis for establishing the quantity and quality of data needed to support decision-making. The DQOs were used to develop a scientific and resource-effective design for data collection. The updated DQOs are presented below.

Step 1: State the Problem

The site consists of 18 properties on 4.12 acres in Kilauea on the Island of Kauai. The site is in a residential setting, consisting predominantly of single-family homes. The site includes a multi-unit apartment facility, and two commercial properties. The site was formerly part of the Kilauea Sugar Company Ltd. Mill from approximately 1877 to 1972 and portions of the site were used for pesticide storage, pesticide mixing, and seed dipping activities. The analytical results from previous samplings indicated that soils in certain areas are impacted with TEQ dioxins, total arsenic, bioaccessible arsenic, mercury, pentachlorophenol, and lead. Soil environmental hazards from direct exposure, terrestrial ecology through runoff, and gross contamination were identified in the preliminary EHE. The complete nature and extent of contamination has not been identified and there is not sufficient information to select the appropriate remedial action to mitigate the hazards.

Step 2: Identify the Project Goals, Objectives, and COPC

The project goals for the site investigation were to support:

- **Protection of human health and the environment**
    - Due to the confirmed presence of impacted soil at the site, the primary project goal was to ensure protection of human health and the environment through the determination of nature and extent of contamination and evaluation of environmental hazards at the site. The site investigation was designed to generate sufficient data to facilitate the development and assessment of several action alternatives. Subsequently, one of the action alternatives may be selected and implemented in order to reduce and/or eliminate exposure pathways to the impacted soil identified at the site.
- **To address resident and neighborhood concerns**
    - Due to the site being primarily used for residential purposes, there were considerable concerns for residents and property owners within the site boundaries and within the general vicinity/neighborhood of the site. The site investigation was designed to generate sufficient data to determine if the impacted soil is localized within previously identified areas or if it extends beyond those areas.

- **To address community concerns**
  - Due to the specific nature and history of the site, there were considerable community concerns related to the confirmed presence of impacted soil at the site. Several Hawaii State and County of Kauai government agencies, elected officials, and their corresponding stakeholders have expressed interest in the scope and status of the site investigation.

The site investigation was to further characterize and delineate the extent and magnitude of COPC associated with the previously defined Core PMA. It focused on delineating the vertical and horizontal extent of identified COPC in and adjacent to the Core PMA.

Soil samples were collected from 26 DUs at the site. The specific COPC varied depending on the DU. The COPC for this project were segregated into four categories:

- Primary COPC
- Full PMA COPC
- Waste categorization COPC
- Other COPC

Primary COPC:

- The primary COPC were determined based on the analytical results from the HEER Office's three previous samplings and the information in the HEER Office Technical Guidance Manual (TGM). The primary COPC included TEQ dioxins, arsenic (total arsenic and bioaccessible arsenic), mercury, lead, pentachlorophenol, TPH-DRO, and TPH-RRO. Samples from DU1 to DU25 were analyzed for the primary COPC.
- Previous sampling events did not include analysis for TPH-DRO or TPH-RRO and there was no confirmed presence of either of these contaminants at the site. TPH-DRO and TPH-RRO were included as COPC because these contaminants are often associated with PMA sites due to their use as mixing agents. Section 9.1.1 of the HEER Office TGM recommends that samples collected from PMA sites be analyzed for TPH-DRO and TPH-RRO (HEER Office 2011c). The decision to analyze samples for TPH-DRO and TPH-RRO was determined in the field, based on the presence of petroleum-impacted soil as determined by visual and olfactory observation, or soil headspace screening readings.

Full PMA COPC:

- The full PMA COPC were determined based on the recommended sampling suite for PMA sites as discussed in Section 9.1.1 of the HEER Office TGM (HEER Office 2011c). The full PMA COPC included TEQ dioxins, TPH-DRO, TPH-RRO, organochlorine pesticides, chlorinated herbicides, SVOC, Modified Pesticide

Screen (including organophoshporus pesticides and triazine pesticides), carbamate herbicides, and total metals. Samples collected from DU26 and DU27 were analyzed for the full PMA COPC. The decision to analyze these samples for the full PMA COPC was based on the identification of the debris layer in the field.

Waste Categorization COPC:

- The waste categorization COPC were determined based on the required sampling suite for hazardous waste determination as outlined in Hawaii Administrative Rules (HAR) Title 11 Chapter 262 Section 11 (HDOH Solid and Hazardous Waste Branch [SHWB] 2011). The waste categorization COPC included toxicity leaching characteristic procedure (TCLP) organochlorine pesticides, TCLP metals, pH, and flammability. Samples collected from DU10 to DU17 were analyzed for the waste categorization COPC. The individual layer with the highest detected COPC concentrations from these DUs will be subsequently analyzed for the waste categorization COPC. This will provide preliminary information needed for evaluating potential disposal options of the impacted soil in the Core PMA. The three investigation-derived waste (IDW) samples from the remaining soil cuttings were analyzed for the waste categorization COPC.

Other COPC:

- The samples from DU10 and DU11 were analyzed for other COPC at the direction of the HEER Office. This included analysis for volatile organic compounds (VOC), SVOC, and chlorinated herbicides. The decision to include these other COPC for DU10 and DU11 was based on the presence of petroleum-impacted soil.

Step 3: Identify Data Information Needs

The existing data needed to complete this site investigation included: historical knowledge regarding use of the site, the analytical results from the HEER Office's three previous samplings (August 2010, December 2010, and March 2011) and HHA property debris pit January 2011 sampling, and the previous sample location boundaries.

New data generated from the site investigation was evaluated as part of the DQO process. This new data included: analytical results for soil samples; analytical results for quality assurance/quality control (QA/QC) samples; and the applicable screening criteria.

The media of concern for this investigation is soil. Based on the preliminary EHE, identified environmental hazards that exist at the site include direct exposure, potential terrestrial ecology through runoff, and gross contamination. To address the project objectives, the multi-increment sampling strategy and layer composite sampling strategy were implemented.

Step 4: Define Study Boundaries

Spatial boundaries included: geographical boundaries of each soil boring and DU as specified in this report, the boundaries of each of the 18 properties at the site, and sample depths.

Temporal boundaries included: field work, laboratory analysis, and data evaluation. Field activities were conducted in July and August 2011, followed by additional time for laboratory analysis and evaluation of sample results.

A total of 26 DUs were delineated; they are shown on Figures 7 and 8. They are in five distinct areas of the site:

- Area 1: Perimeter of Core PMA (9 DUs)
- Area 2: Core PMA and drainage outfall (10 DUs)
- Area 3: Potentially impacted exposed surface soils – not previously sampled (3 DUs)
- Area 4: Surrounding properties (2 DUs)
- Area 5: HHA debris and trash pit (2 DUs)

DUs varied in size from approximately 400 to 12,000 square feet. The majority of the DUs are approximately 400 to 2,000 square feet.

Originally, there were plans for 27 DUs, but DU20 (in the West Drainage Outfall) was eliminated after the SAP was submitted to the HEER Office. The DU ID numbers were not altered to reflect the deletion since all of the project plans and figures had already been completed. See Section 5 for additional details about the DUs.

Each of the 26 DUs were divided into five designated layers, as described below:

- Layer A: 0-0.5 foot bgs
- Layer B: 0.5-2 feet bgs
- Layer C: 2-4 feet bgs
- Layer D: 4-7 feet bgs
- Layer E: 7-10 feet bgs

With the exception of DU18 and DU19, all of the DUs are located in the site boundaries. DU18 and DU19 are off-site in the West Drainage Outfall that was historically used by the Kilauea Sugar Company, Ltd. Mill to carry the cane wash wastewater away from the mill to the Pacific Ocean.

A total of 96 soil borings were advanced throughout the 26 DUs. Soil borings were advanced in DU1 to DU17, DU26, and DU27. Between 3 to 7 soil borings were advanced in each of these DUs. No soil borings were advanced in DU18, DU19, and DU21 to DU25 that were evaluated through the collection of multi-increment samples collected manually from 0-0.5 foot bgs.

A total of 118 soil samples were collected from the 26 DUs. The specific number of samples collected per DU varied depending on the DU and targeted layers (see Section 5.4 for further details).

An iterative analysis approach (see Section 7.2) was used for all the DUs where multiple layers were to be evaluated (DU1 to DU17). The iterative analysis approach was proposed to most efficiently use the HEER Office's funding allocated for the site investigation.

The specific COPC selected for each sample were dependent on the DU and the layer (see Section 7.2 for further details).

Step 5: Develop Decision Rules

The analytical results were compared to the Tier I EALs for soils on unrestricted use and commercial or industrial use sites, where potentially impacted groundwater is not a current or potential drinking water resource, and with surface water bodies more than 150 meters from the site.

If analytical results for samples collected from a given DU indicate COPC concentrations are below the applicable Tier I EALs, no additional soil sampling or remedial action activities will be recommended for that specific DU.

If analytical results for samples collected from a given DU indicate COPC concentrations exceed the applicable Tier I EALs, additional evaluation (e.g., sampling, hazard assessment, etc.) or remedial action may be required to address the nature and extent of contamination or hazards for that specific DU.

All decision rules will be made based on DUs, not by property. For example, if impacted soil is identified in one DU but not in another DU on the same property, only the DU with impacted soil will be recommended for further evaluation (opposed to the entire property).

The HEER Office will review the site investigation report and determine if any additional evaluation or remedial actions are necessary.

Step 6: Develop and Implement the SAP

The sampling design for this site investigation included the collection of 118 soil samples from 26 DUs as detailed in Step 4.

The site investigation implemented the multi-increment and layer composite sampling strategies discussed in the SAP. Collection of multi-increment soil samples in a systematic-random manner maximizes the goal of obtaining sufficient material throughout the DU and accounting for both compositional and distributional heterogeneity. Collection of layer composite samples in a strategic manner maximizes the goal of obtaining sufficient material throughout the DU and addresses distributional heterogeneity concerns (Tetra Tech 2011).

Tetra Tech used internal standard operating procedures and sampling protocols from the HEER Office TGM to develop the SAP. QA/QC requirements ensure the quality of data generated during the site investigation. The

HEER Office reviewed and approved the SAP in July 2011, and worked closely with Tetra Tech throughout the project.

Step 7: Assess Data Quality

Analytical data must meet the project specifications for precision, accuracy, representativeness, completeness, and comparability as described in Section 8 of the SAP (Tetra Tech 2011).

Data precision was assessed through collection and evaluation of field QC samples (i.e., triplicates). The QA/QC objective was to have all field QC samples agree within 35 percent relative standard deviation for all COPC that exceeded the screening criteria.

Laboratory analytical accuracy was assessed through laboratory QC samples (i.e., matrix spike/matrix spike duplicates, laboratory control samples and laboratory control sample duplicates, blank spikes, surrogate standards, and method blanks). The specific QA/QC objectives for laboratory QC samples were based on the type and condition of sample analyzed; it is sample-specific.

Tetra Tech interpreted the analytical data from the site investigation to identify data trends, data gaps, and develop conclusions.

Additional criteria related to the procedures and protocols of the site investigation are documented in the QA/QC Plan, in Section 8 of the SAP (Tetra Tech 2011).

Step 8: Identify Potential Environmental Hazards

The analytical results were compared to the EALs and Tier I EALs for soils on unrestricted use and commercial or industrial use sites, where potentially impacted groundwater is not a current or potential drinking water resource, and with surface water bodies more than 150 meters from the site. Tetra Tech used the EAL Surfer spreadsheet to conduct an updated EHE using the site investigation's analytical data set.

For the exceedences of applicable EALs and Tier I EALs, Tetra Tech documented the specific environmental hazards that exist at the site. Tetra Tech screened for the following environmental hazards as part of the updated EHE: direct exposure, vapor intrusion, terrestrial ecology through runoff, gross contamination, and leaching.

Step 9: Refine Conceptual Site Model and Recommend Further Actions

Upon completion of the site investigation, the HEER Office will review site conditions, analytical results, and the updated EHE. The HEER Office will identify and recommend additional evaluation or response action activities, as necessary.

5 Sampling Design and Protocols

This section has the sampling design and protocols for the site investigation.

5.1 Decision Unit Delineation

A total of 26 DUs were delineated at the site. The DU locations are shown on Figures 7 and 8. An overlay of the site investigation DU locations and the previous investigations' DU locations is shown on Figure 9.

These DUs were delineated to:

- Address data gaps regarding the extent of COPC along the perimeter of the Core PMA.
- Further characterize and delineate the vertical extent of COPC in the Core PMA, and assess if historical PMA activities impacted the West Drainage Outfall.
- Assess the potentially impacted and exposed surface soils on the Old Mill LLC property that were not previously sampled by the HEER Office.
- Assess if historical PMA activities impacted two near and surrounding properties, the Sansevere property and the Hadley property, south of Oka Street.
- Evaluate the extent of buried debris and trash associated with the debris pit previously identified on the HHA property.

The DUs were grouped corresponding to five distinct areas (see Figure 7):

- Area 1: Perimeter of Core PMA (9 DUs – DU1 to DU9)
- Area 2: Core PMA and West Drainage Outfall (10 DUs – DU10 to DU19)
- Area 3: Potentially Impacted Exposed Surface Soils – Not Previously Sampled (3 DUs – DU21 to DU23)
- Area 4: Surrounding Properties (2 DUs – DU24 to DU25)
- Area 5: HHA Debris and trash pit (2 DUs – DU26 to DU27)

DU size varied, ranging from approximately 400 to 12,000 square feet. The majority of the DUs were in the approximately 400 to 2,000 square feet size range.

Originally, there were plans for 27 DUs, but DU20 (in the West Drainage Outfall) was eliminated after the SAP was submitted to the HEER Office. The ID numbers were not altered to reflect the deletion of DU20, because all of the project plans and figures had already been completed.

5.1.1 Area 1: Perimeter of Core Pesticide Mixing Area

Area 1 included DU1 to DU9. These DUs were delineated to address data gaps regarding the extent of COPC along the perimeter of the Core PMA. Table 8 has an overview of Area 1 DUs.

Table 8 – Overview of Area 1 Decision Units

Location ID	Description	Overlap with Previous DOH DU/Sample	Intent/Scope
DU1	Surface Area: 393 square feet Along the eastern border of the North Shore Health Center property, adjacent to Aalona Street.	KSPMA-DU5	Assess the vertical extent of COPC along the western perimeter of the Core PMA.
DU2	Surface Area: 475 square feet Along the eastern borders of the Grace Paul Trust property, Clarion property, and Howard property; adjacent to Aalona Street.	KSPMA-DU2 KSPMA-DU3	
DU3	Surface Area: 425 square feet Along the eastern borders of the Johnson property, Deforge property, and the southern borders of the Cooper property, Cudiamat property, and Owens property; adjacent to the cul-de-sac portion of Aalona Street.	KSPMA-DU1 KSPMA-DU4	
DU4	Surface Area: 2,941 square feet Along the southern border of the Ortal property, adjacent to the Foley property.	None	Assess the horizontal and vertical extent of COPC along the northern perimeter of the Core PMA.
DU5	Surface Area: 403 square feet Along the western border of the HHA property. This DU is adjacent to the Ortal property and Foley property.	KKSC-DU1 KKSC-DU2	Assess the horizontal and vertical extent of COPC along the northern perimeter of the Core PMA.
DU6	Surface Area: 1,909 square feet Along the southern border of the HHA property, adjacent to the Natural Bridges School property.	None	Assess the potentially accessible soil for occupants and students of the Natural Bridges School. In addition, the intent of these DUs is to assess potential impacts from historical Kilauea Sugar Company, Ltd. Mill PMA activities in an area located upgradient of the Drainage Swale, as well as to assess the horizontal and vertical extent of COPC along the eastern perimeter of the Core PMA.
DU7	Surface Area: 1,940 square feet Along the southern border of the HHA property, adjacent to the Natural Bridges School property.	None	
DU8	Surface Area: 541 square feet Along the eastern border of the Old Mill LLC property, adjacent to the Natural Bridges School property.	None	Assess the horizontal and vertical extent of COPC along the eastern perimeter of the Core PMA.
DU9	Surface Area: 541 square feet Along the southern border of the Old Mill LLC property, adjacent to Oka Street.	None	Assess the horizontal and vertical extent of COPC along the southern perimeter of the Core PMA.

Please note that there was no overlap of new DUs with previous DOH KKSC-DU4. Initially, DU5 and DU26 were planned to overlap with KKSC-DU4. However, because of the presence of a terraced garden with mature vegetation on the Foley property in this location, DU5 and DU26 were moved immediately to the southeast, abutting the KKSC-DU4 location.

5.1.2 Area 2: Core Pesticide Mixing Area

Area 2 included DU10 to DU19. These DUs were delineated to further characterize and delineate the vertical extent of COPC in the Core PMA, and assess if the West Drainage Outfall was impacted by if historical Kilauea Sugar Company, Ltd. Mill PMA activities. Table 9 has an overview of the Area 2 DUs.

Table 9 – Overview of Area 2 Decision Units

<table>
<tr><th>Location ID</th><th>Description</th><th>Overlap with Previous DOH DU/Sample ID</th><th>Intent/Scope</th></tr>
<tr><td rowspan="2">DU10</td><td>Surface Area: 1,611 square feet</td><td rowspan="2">KSPMA-DU6
KSPMA-DU7</td><td rowspan="12">Further characterize and delineate the vertical extent of COPC within the Core PMA.</td></tr>
<tr><td>Within the western portion of the Drainage Swale, which is along the northern border of the Old Mill LLC property.</td></tr>
<tr><td rowspan="2">DU11</td><td>Surface Area: 604 square feet</td><td rowspan="2">KSPMA-DU8</td></tr>
<tr><td>Within the eastern portion of the Drainage Swale, which is along the northern border of the Old Mill LLC property.</td></tr>
<tr><td rowspan="2">DU12</td><td>Surface Area: 1,745 square feet</td><td rowspan="2">KKSC-DU5</td></tr>
<tr><td>Within the front yard of the Thompson property, adjacent to Aalona Street.</td></tr>
<tr><td rowspan="2">DU13</td><td>Surface Area: 553 square feet</td><td rowspan="2">None</td></tr>
<tr><td>Within the north side yard of the Thompson property, adjacent to the Foley property.</td></tr>
<tr><td rowspan="2">DU14</td><td>Surface Area: 598 square feet</td><td rowspan="2">KKSC-DU6
KKSC-DU7
KKSC-DU8</td></tr>
<tr><td>Within the back yard of the Thompson property, adjacent to the Foley property.</td></tr>
<tr><td rowspan="2">DU15</td><td>Surface Area: 872 square feet</td><td rowspan="2">KKSC-DU6
KKSC-DU7
KKSC-DU8</td></tr>
<tr><td>Within the south side yard of the Thompson property, adjacent to the Drainage Swale.</td></tr>
<tr><td rowspan="2">DU16</td><td>Surface Area: 1,058 square feet</td><td rowspan="2">None</td><td rowspan="2">Further characterize and delineate the vertical extent of COPC within the Core PMA. This DU will also address a data gap between the Thompson property (within Core PMA) and the Ortal Property (part of the northern perimeter of the Core PMA).</td></tr>
<tr><td>Within the driveway of the Foley property, adjacent to the Thompson property.</td></tr>
<tr><td rowspan="2">DU17</td><td>Surface Area: 1,562 square feet</td><td rowspan="2">KKSC-DU3</td><td rowspan="2">Further characterize and delineate the vertical extent of COPC within the Core PMA.</td></tr>
<tr><td>Within the back yard of the Foley property, adjacent to the Drainage Swale.</td></tr>
<tr><td rowspan="2">DU18</td><td>Surface Area: 1,200 square feet</td><td rowspan="2">None</td><td rowspan="4">Assess if the West Drainage Outfall was impacted by if historical PMA activities. The West Drainage Outfall is the ultimate stormwater discharge point for the County of Kauai's stormwater drainage system on Aalona Street. The County's stormwater drainage system is directly connected to the Drainage Swale on the Old Mill LLC property, which is within the Core PMA.</td></tr>
<tr><td>Within West Drainage Outfall, adjacent to the intersection Kilauea Road and Oka Street and extending westward from the area where the drainpipe discharges.</td></tr>
<tr><td rowspan="2">DU19</td><td>Surface Area: 2,400 square feet</td><td rowspan="2">None</td></tr>
<tr><td>Within the West Drainage Outfall, approximately 0.42 miles to the northwest of DU18 near the access road.</td></tr>
</table>

5.1.3 Area 3: Potentially Impacted Exposed Surface Soils – Not Previously Sampled

Area 3 included DU21 to DU23, delineated to assess the potentially impacted and exposed surface soils on the Old Mill LLC property that were not previously sampled by the HEER Office. Table 10 has an overview of the Area 3 DUs.

Table 10 – Overview of Area 3 Decision Units

Location ID	Description	Overlap with Previous DOH DU/Sample ID	Intent/Scope
DU21	Surface Area: 352 square feet Two separate areas on the Old Mill LLC property: (1) Along the western border of the Old Mill LLC property, adjacent to Aalona Street. (2) Along the southern border of the Old Mill LLC property, adjacent to Oka Street. These areas have exposed soil and grass.	None	Assess the potentially impacted and exposed surface soils on the Old Mill LLC property, which is part of the Core PMA.
DU22	Surface Area: 666 square feet Along the western border of the Old Mill LLC property, adjacent to the Drainage Swale. This area has exposed soil and gravel.	None	Assess the potentially impacted and exposed surface soils immediately adjacent to the Drainage Swale on the Old Mill LLC property, which is part of the Core PMA.
DU23	Surface Area: 971 square feet Within the raised planter box along the southern border of the Old Mill LLC property. This area has exposed soil and grass.	None	Assess the potentially impacted and exposed surface soils on the Old Mill LLC property, which is part of the Core PMA.

5.1.4 Area 4: Surrounding Properties

Area 4 included DU24 and DU25. These DUs were delineated to assess if two surrounding properties, south of Oka Street, were impacted by historical Kilauea Sugar Company, Ltd. Mill PMA activities. Table 11 has an overview of the Area 4 DUs.

Table 11 – Overview of Area 4 Decision Units

Location ID	Description	Overlap with Previous DU/Sample ID	Intent/Scope
DU24	Surface Area: 4,271 square feet Within the front, back, and side yards of the Sansevere property, to the southeast of the intersection of Aalona Street and Oka Street.	None	Assess if these two surrounding residential properties located south of the Core PMA were impacted by historical PMA activities. These two DUs will also address a data gap for areas located upgradient of the Core PMA, for which no previous sampling was conducted.
DU25	Surface Area: 3,977 square feet Within the front, back, and side yards of the Hadley property, south of Oka Street.	None	

5.1.5 Area 5: Hawaii Housing Authority Debris Pit

Area 5 included DU26 and DU27. These DUs were delineated to evaluate the extent of buried debris and trash associated with debris pit previously identified on the HHA property. Table 12 has an overview of the Area 5 DUs.

Table 12 – Overview of Area 5 Decision Units

Location ID	Description	Overlap with Previous DOH DU/Sample ID	Intent/Scope
DU26	Surface Area: 403 square feet Along the western border of the HHA property, west of Building B[1]. This DU is adjacent to the Ortal property and Foley property.	KKSC-DU1 KKSC-DU2 KBV-01	Evaluate the extent of buried debris/trash and potentially related COPC associated with debris pit previously identified on the HHA property to the north of Building B. Evaluate the potential for the debris pit to extend westward and onto the Ortal Property and the Foley Property.
DU27	Surface Area: 2,130 square feet Along the western border of the HHA property, south of Building B[1].	KKSC-DU2	Evaluate the extent of buried debris/trash and potentially related COPC associated with debris pit previously identified on the HHA property to the north of Building B. Evaluate the potential for the debris pit to extend westward and onto the Foley Property.

NOTES:

1 = The location and size of DU26 and DU27 were determined based on the observed field conditions and the confirmed presence of debris in the field.

5.2 Decision Unit Layer Designation

Each of the 26 DUs was divided into five designated layers ranging in thickness from 0.5-3 feet:

- Layer A: 0-0.5 foot bgs
- Layer B: 0.5-2 feet bgs
- Layer C: 2-4 feet bgs
- Layer D: 4-7 feet bgs
- Layer E: 7-10 feet bgs

A complete description of the DU layers and sampling strategies for each DU is in Section 5.4.

5.3 Soil Boring Advancement

Geotek Hawaii, Inc. (Geotek) was contracted to provide soil boring and drilling services for the site investigation. Geotek advanced 96 soil borings during the site investigation.

Two different direct-push Geoprobe® drilling rigs were used for soil boring. For larger DUs with adequate access and space, a track-mounted Geoprobe® 66 Series drilling rig was used. For smaller DUs where access was a concern, a portable dolly-mounted Geoprobe® 420 Series drilling rig was used. Both of these drilling rigs used the macro-core sampler technology. The macro-core sampler enables continuous sampling in each soil boring. All of the soil borings were advanced to 10 feet bgs, or until there was no evidence of debris in the soil borings from DU26-DU27. Relevant observations were recorded during the drilling, including lithology classification on soil boring logs. Copies of the soil boring logs are in Appendix F.

5.3.1 Soil Boring Placement and Spacing

Soil borings in the Drainage Swale (DU6, DU7, DU10, and DU11) were placed using the staggered increment pattern—effectively a zigzag pattern (i.e., left-center-right-center-left, then repeat).

For the remaining DUs, the soil borings were placed using a grid pattern or linear method, depending on the width of the DU. There were no fewer than three borings per DU. Soil borings were spaced approximately 20 feet apart in narrow DUs, and approximately one soil boring per 300 square feet in larger DUs.

5.4 Soil Sampling Activities

The multi-increment sampling strategy and the layer composite strategy were followed for all samples collected during the site investigation. Sample collection locations are shown on Figures 7 and 8.

5.4.1 Multi-increment Sampling Strategy

Multi-increment sampling can control the two major types of sampling error that affect environmental investigations: fundamental error (FE), and grouping and segregation error (GSE). FE is managed by collecting and analyzing a sufficient sample mass to adequately address compositional heterogeneity. GSE is controlled by collecting multiple randomly located sample increments to address the distributional heterogeneity.

The multi-increment sampling strategy was implemented for the surface soil samples collected from Layer A in DU6, DU7, DU18, DU19, and DU21-DU25. Table 13 has a summary of the DUs where multi-increment samples were collected.

Table 13 – Decision Units with Multi-increment Samples

Location ID[1]	Site Area	Type of Sample	Layers Sampled	Sampling Pattern	Total Number of MI Samples Collected
DU6	Area 1	MI	Layer A	Orthogonal	3 (Triplicate)
DU7	Area 1	MI	Layer A	Orthogonal	1
DU18	Area 2	MI	Layer A	Zigzag	3 (Triplicate)
DU19	Area 2	MI	Layer A	Zigzag	1
DU21	Area 3	MI	Layer A	Orthogonal	1
DU22	Area 3	MI	Layer A	Orthogonal	1
DU23	Area 3	MI	Layer A	Orthogonal	1
DU24	Area 4	MI	Layer A	Orthogonal	3 (Triplicate)
DU25	Area 4	MI	Layer A	Orthogonal	1

NOTES:
1 = See Figures 7 and 8 for DU locations.
MI = Multi-increment

5.4.1.1 Summarized Sampling Protocol for Multi-increment Samples

All multi-increment soil samples were collected with a stainless steel hand trowel or soil probe. Sampling began at a random location in each DU.

For DU6, DU7, and DU21-DU25 sampling proceeded in an orthogonal pattern in a systematic-random manner.

For DU18 and DU19 sampling proceeded using the staggered increment zigzag pattern (i.e., left-center-right-center-left, then repeat).

Prior to sampling at each increment subsample location, a stainless steel hand trowel was used to penetrate the ground surface and clear debris. A stainless steel hand trowel or soil probe was used to collect and transfer approximately 30 to 60 grams of soil directly into a clean 1-gallon Ziploc bag that was labeled and re-bagged in a second 1-gallon Ziploc bag to prevent the loss of sample material. This process continued until all 30 increment subsamples were collected. Individual subsamples were combined to form a single, multi-increment sample for laboratory analysis for each designated layer in the DU. All increment subsamples were collected from Layer A (0-0.5 foot bgs).

Triplicate samples were collected from DU6, DU18, and DU24 to verify that the primary multi-incremental sample truly represents the DU. These field replicate samples were used to calculate the RSD—a measure of data precision.

5.4.2 Layer Composite Sampling Strategy

Due to the relatively small size of the DUs and the developed nature of the site properties, advancing 30 or more soil borings in each DU was not feasible,so the multi-increment soil sampling was not used exclusively for this site investigation.

Instead, a layer composite sampling strategy was implemented for the soil samples collected during the site investigation. Collecting layer composite samples is a sampling approach used for samples collected from soil borings using the macro-core sampler technology. Each layer composite sample contains soil from the entire layer (the vertical length of interest), whereas a discrete soil sample would only contain soil from a small portion of the vertical length of interest. The layer composite sampling strategy minimizes the GSE associated with traditional discrete samples.

For soil borings in areas or DUs that had not been sampled, the sample interval started at surface grade (Layer A). For soil borings located in areas and DUs previously sampled by the HEER Office, the sample interval started at the 0.5 foot bgs depth (Layer B) for consistency.

The layer composite sampling strategy was implemented as follows:

- For Layers A-E in DU1 to DU5, and DU8 to DU17
- For Layers B-E in DU6 and DU7

    - For DU6 and DU7 layer composite samples were not collected from Layer A because multi-increment samples were collected from this layer instead. Refer to Section 5.4.1 for further details.
- For the observed debris layer (typically from 3-4.5 feet bgs) in DU26 and DU27
    - These DUs were related to the debris pit identified on the HHA property. In these DUs, samples were collected from the observed debris layer, as identified in the field.

Table 14 presents a summary of the DUs where layer composite samples were collected.

Table 14 – Decision Units with Layer Composite Samples

Location ID[1]	Site Area	Number of Borings per DU	Type of Sample	Layers Sampled	Total Number of LC Samples Collected
DU1	Area 1	5	LC	Layers A to E	5
DU2	Area 1	5	LC	Layers A to E	5
DU3	Area 1	5	LC	Layers A to E	5
DU4	Area 1	7	LC	Layers A to E	15 (Triplicate)
DU5	Area 1	5	LC	Layers A to E	5
DU6	Area 1	5	LC	Layers B to E[2]	12 (Triplicate)
DU7	Area 1	5	LC	Layers B to E[2]	4
DU8	Area 1	5	LC	Layers A to E	5
DU9	Area 1	7	LC	Layers A to E	5
DU10	Area 2	5	LC	Layers A to E	5
DU11	Area 2	5	LC	Layers A to E	5
DU12	Area 2	6	LC	Layers A to E	5
DU13	Area 2	3	LC	Layers A to E	5
DU14	Area 2	3	LC	Layers A to E	5
DU15	Area 2	3	LC	Layers A to E	5
DU16	Area 2	3	LC	Layers A to E	5
DU17	Area 2	4	LC	Layers A to E	5
DU26	Area 5	7[a]	LC	Observed Debris Layer[a]	1[a]
DU27	Area 5	8[a]	LC	Observed Debris Layer[a]	1[a]

NOTES:
1 = See Figures 7 and 8 for DU locations.
2 = For DU6 andDU7 layer composite samples were not collected from Layer A because multi-increment samples from this layer instead.
a = Samples were only collected from the observed debris layer (typically 3-4.5' bgs), as identified in the field. The number of borings was determined based on field observations.
LC = Layer composite

5.4.2.1 Summarized Sampling Protocol for Layer Composite Samples

All layer composite samples from Layers A to E were collected with a stainless steel chisel that was used to extract the soil core from the macro-core sampler for the designated layer. The soil core contained soil for the entire layer (the vertical length of interest). The extracted soil core was transferred directly into a clean 1-gallon Ziploc bag that was labeled and re-bagged in a second 1-gallon Ziploc bag to prevent the loss of sample material. This process continued until all soil cores for the designated layer were collected from all of the soil borings in the DU. Individual soil cores were combined to form a single, layer composite sample for laboratory analysis for each designated layer in the DU. Layer composite samples were collected for Layers A to E, depending on the DU.

Triplicate samples were collected from DU4 and DU6 to verify that the primary layer composite sample truly represents the DU. These field replicate samples were used to calculate the RSD—a measure of data precision.

5.4.3 Soil Headspace Screening

Soil was collected during various stages of the site investigation to screen for soil headspace organic vapors using a RAE MiniRae 2000 photoionization detector (PID) (MiniRae 2000 unit).

The MiniRae 2000 unit was calibrated daily using zero air and 100 ppm isobutylene gas per the manufacturer's instructions. At each selected location, a portion of soil was placed into a 1-quart Ziploc bag and sealed to obtain a total organic vapor measurement. The Ziploc bag was placed in direct sunlight for approximately 5 minutes to allow the vapor concentrations in the headspace to reach equilibrium. A sample of the air from the Ziploc bag was drawn into the MiniRae 2000 unit and recorded in accordance with the ambient temperature headspace method.

All concentrations exceeding 100 ppm were considered elevated total organic vapors. Tetra Tech recorded all headspace sample readings in the soil boring log forms. Copies of the soil boring logs are in Appendix F.

6 Overview of Field Activities

This section has a detailed overview of the field activities that were part of the site investigation.

6.1 Summary of Field Activities

Tetra Tech performed field activities for the site investigation from July 6-7, 2011, and August 1-12, 2011, including a site reconnaissance, collecting soil samples, shipping samples to the analytical laboratories, and coordinating the management of the IDW. A detailed description of these activities is presented below. Fields activities were conducted in accordance with the SAP (Tetra Tech 2011) and any deviations from the SAP have been noted in Section 7.7. Photographs from the site investigation are in Appendix A.

6.2 Documentation

Tetra Tech personnel recorded pertinent information in field log forms. Information was recorded daily throughout the site investigation, including a summary of site activities and significant events, weather conditions,, and the name and affiliation of all on-site personnel.

Tetra Tech prepared soil boring logs for each of the soil borings in the 26 DUs. Copies are in Appendix F. Tetra Tech tracked all samples collected in a sample log. The complete sample log included the following information for each sample: sample identification, time and date collected, matrix, number and type of sample containers, depth, and notes.

6.3 Site Reconnaissance

On July 6 and 7, 2011, Tetra Tech conducted the site reconnaissance. On July 6, 2011, Tetra Tech was accompanied by HEER Office representatives, a Geotek representative, and a Donaldson Enterprises, Inc. (DEI) representative. On July 7, Tetra Tech and DEI were on-site for subsurface utility clearance activities, further discussed in Section 6.4.

The site reconnaissance was conducted prior to beginning sampling activities. All readily accessible portions of the site were examined during the site reconnaissance. The purpose of the site reconnaissance was to document current uses and operations, to delineate proposed DUs, and to evaluate access to the proposed DUs with the drilling contractor. Because there was limited access at DU5, DU17, and DU26, Geotek decided that a portable dolly-mounted Geoprobe® 420 Series drilling rig would be necessary for these DUs.

6.4 Subsurface Utility Clearance

The Hawaii One Call Center was contacted prior to conducting any intrusive work at the site. No issues were identified by the Hawaii One Call Center.

Tetra Tech contracted DEI to provide subsurface utility clearance services. On July 6 to 7, 2011, DEI conducted subsurface utility locating activities using ground-penetrating radar and electromagnetic equipment. DEI used, orange spray paint to mark the areas where utilities or other subsurface anomalies were identified.

Based on the findings of the subsurface utility clearance, Tetra Tech relocated a few soil boring locations as appropriate to avoid the subsurface features.

6.5 Surveying of Soil Borings

On July 7, 2011, the corners of each DU were located and the location of the soil borings for each marked using stakes and green spray paint. The soil borings were placed so they were generally evenly spaced throughout the DU and clear of any areas marked during the utility clearance. Because weak satellite signals caused low accuracy readings in the hand-held global position unit (GPS), the GPS coordinates were not collected for the soil borings. However, the location of each soil boring was accurately documented in the field logs with references to the direction and distance to permanent site features, such as buildings or utility poles.

As indicated in the SAP, the Kauai County Department of Public Works (KDPW) was considering if a formal land survey would be required prior to any drilling to determine if any DUs or soil borings were in the county right-of-way (ROW). The land survey is part of the routine permitting process administered by the KDPW for construction activities in a county ROW. The HEER Office invoked Hawaii Revised Statute 128D-23 that provides the HEER Office with an exemption from the county road permit requirement to undertake the proposed remedial action at the site that includes this site investigation. Therefore, a formal land survey was not required by the KDPW.

6.6 Brush Clearing

Brush clearing was only required for DU18 to provide access to the West Drainage Outfall for sampling. A local landscaping company was subcontracted to clear brush on August 10, 2011.

6.7 Sample Collection

Samples were collected from August 1-12, 2011. During the site investigation, Tetra Tech collected 121 samples, including 118 soil samples from the 26 DUs, and three IDW samples from the remaining soil cuttings. A detailed description of sampling activities is in Section 7.

6.8 Summary of Field Observations

During this investigation, Tetra Tech made the following observations and notes that may be significant in defining and identifying the presence of potential impacted soil:

- Moderate to strong petroleum odors were noted in DU10 (Layers D to E), DU12 (Layers C to E), and DU14 (Layers C to D).
- Moderate to strong solvent or chemical odors were noted in DU10 (Layers B to E) and DU12 (Layers B to D).
- In DU10, several of the soil cores had petroleum sheens with a black, dark-grey coloration. The soil borings nearest Aalona Street had the greatest degree of impact.
- In DU26 and DU27, the debris layer was typically from 3-4.5 feet bgs. Debris included glass, scrap metal, ash, and white powder. Not all debris items were in each boring; the debris was distributed unevenly throughout each DU. Based on the field conditions, and due to the random distribution of debris, the volume/extent of debris in the debris pit could not accurately be estimated. Refer to the soil boring logs in Appendix F for further details on the debris layer.
- Evidence of debris was noted in DU18. Debris included scrap metal and wood, household cleaning supplies, and general rubbish (plastic bags, aluminum cans, etc.).

6.9 Decontamination

The decontamination protocols outlined in the SAP were used during this investigation.

6.10 Management of Investigation-Derived Waste

The IDW included disposable consumable equipment (e.g., gloves and paper towels) soil cuttings, and decontamination water. All consumable equipment was double-bagged and properly disposed of in a municipal disposal bin at an off-site facility. The soil cuttings were temporarily stored in individual 5-gallon buckets per DU, and the decontamination water was stored in individual 5-gallon buckets per field day. These 5-gallon buckets were stored in a secure, fenced location at the Old Mill LLC property, behind the commercial building. All 5-gallon buckets were labeled with the contents and source DU information.

Three multi-increment IDW samples were collected from the soil cuttings prior to transferring the soil cuttings to 55-gallon steel drums. These IDW samples were for analysis of waste categorization COPC. Samples were collected as follows: one sample was collected from the Area 1, 3, and 4 DUs (DU1 to DU9 and DU21 to DU25); one sample was collected from the Area 2 DUs (DU10 to DU19); and one sample was collected from the Area 5 DUs (DU26 and DU27). Approximately 30-40 increments were collected for each multi-increment IDW sample, with the number of increments varying depending on the number of DUs comprising the Areas targeted for the sample.

After the IDW sampling, the soil cuttings and decontamination water were transferred from the 5-gallon buckets to 55-gallon steel drums. The IDW drums were stored at the Old Mill LLC property, behind the commercial building. All IDW drums were properly labeled with the relevant information, such as project name and location, company generating the waste, drum ID number, drum contents, and emergency contact name and phone number. Three IDW drums were filled during the field investigation—two filled with soil cuttings, and one filled with decontamination water.

Tetra Tech consulted the HEER Office following review of all analytical results to identify the appropriate disposal method for the IDW drums. Based on the IDW sample analytical results, the drums were not considered hazardous waste and could be disposed of at a permitted landfill facility in Hawaii. Pacific Commercial Services LLC (PCS) provided waste management and disposal services for the drums. PCS tracked all IDW drums until their acceptance at the final disposal facility, PVT Land Company, Ltd. (PVT) Landfill, in Waianae, Hawaii.

On August 12, 2011, PCS transported the IDW drums from the site in Kilauea, Hawaii to their baseyard on Sand Island, in Honolulu, Hawaii. PCS transported the two IDW soil drums to the PVT Landfill, on December 9, 2011. On December 22, 2011, PCS transported the IDW water drum to PVT Landfill. Copies of the waste manifests for the IDW drums are in Appendix G.

6.11 Site Restoration

On August 11-12, 2011, site restoration was completed. Geotek properly backfilled all soil boring holes with a cement-bentonite slurry following the protocols outlined in Section 6.2.5 of the HEER Office TGM (HEER Office 2011c). Geotek repaired all fences that were disassembled to provide drill rig access. Tetra Tech placed sod in grassy areas damaged by the track-mounted drill rig on the Thompson property.

7 Sample Analysis and Control Procedures

This section provides an overview of the sample analysis and control procedures, including COPC categories, iterative sample analysis approach, analytical methods, sample identification, and sample handling.

7.1 Contaminants of Potential Concern

The COPC for this project were segregated into four categories:

- Primary COPC
- Full PMA COPC
- Waste categorization COPC
- Other COPC

7.1.1 Primary COPC

The primary COPC were determined based on analytical results from the HEER Office's three previous samplings and the information in the HEER Office TGM. The primary COPC included TEQ dioxins, arsenic (total arsenic and bioaccessible arsenic), mercury, lead, pentachlorophenol, TPH-DRO, and TPH-RRO. Samples from DU1 to DU25 in Areas 1-4 were analyzed for the primary COPC.

Samples from the three previous HEER Office samplings were not analyzed for TPH-DRO or TPH-RRO. However, TPH-DRO and TPH-RRO were added as COPC for the site investigation, because these two contaminants are often associated with PMA sites due to their use as mixing agents (HEER Office 2011c). The decision to analyze samples for TPH-DRO and TPH-RRO was determined in the field, based on the presence of petroleum-impacted soil as determined by visual and olfactory observation, or soil headspace screening readings. The samples from DU4 and DU10 and DU12 were analyzed for TPH-DRO and TPH-RRO, based on field observations.

7.1.2 Full PMA COPC

The full PMA COPC were determined based on the recommended sampling suite for PMA sites as discussed in Section 9.1.1 of the HEER Office TGM (HEER Office 2011c). The full PMA COPC included TEQ dioxins, TPH-DRO, TPH-RRO, organochlorine pesticides, chlorinated herbicides, SVOC, Modified Pesticide Screen (including organophoshporus pesticides and triazine pesticides), carbamate herbicides, and total metals. Only samples collected from DU26 and DU27 in Area 5 were analyzed for the full PMA COPC. The decision to analyze these samples for the full PMA COPC was determined from identification of the debris layer in the field, as determined by visual observation. The debris layer was typically approximately 3-4.5 feet bgs in DU26 and DU27.

7.1.3 Waste Categorization COPC

The waste categorization COPC were determined based on the required sampling suite for hazardous waste determination outlined in Hawaii Administrative Rules (HAR) Title 11 Chapter 262 Section 11 (HDOH SHWB 2011). The waste categorization COPC included toxicity leaching characteristic procedure (TCLP) organochlorine pesticides, TCLP metals, pH, and flammability. Samples collected from DU10 and DU12 to DU17 in Area 2 were analyzed for the waste categorization COPC.

The project laboratory archived all samples collected during the site investigation. Upon completing the initially-requested analyses, the HEER Office selected which sample layers from these DUs would be analyzed for the waste categorization COPC. For DU12 to DU17, Layer B was analyzed, because it was the individual layer with the highest detected COPC concentrations in these DUs. For DU10, Layers B to E were selected because DU10 had the most significant extent of primary COPC exceedances compared to any DU at the site (i.e., a worst-case scenario). This analysis was to provide preliminary information in the evaluation of potential disposal options for impacted soil in the Core PMA.

The three multi-increment IDW samples collected from the soil cuttings stored in the 5-gallon buckets, prior to transferring the soil cuttings to the 55-gallon drums were analyzed for the waste categorization COPC.

7.1.4 Other COPC

The samples from DU10 and DU11 were analyzed for other COPC at the direction of the HEER Office. This included analysis for VOC, SVOC, and chlorinated herbicides. The decision to include these other COPC for DU10 and DU11 was based on the presence of petroleum-impacted soil.

7.2 Iterative Sample Analysis Procedures

An iterative approach for sample analysis was implemented for all the DUs where multiple layers were evaluated (DU1 to DU17).

The iterative approach implemented for DU1 to DU17 resulted in nearly *all* samples being initially analyzed to Layer C (2-4 feet bgs) (with the exception of DUs where there was existing analytical data for Layer A in these areas or DUs from the previous HEER Office samplings). As a result, the site investigation yielded a uniform and cohesive assessment across all of Area 1 and most of Area 2 (except DU18 and DU19) to 4 feet bgs. This was selected because 0-4 feet bgs is generally considered the commonly encountered soil for residential access based on information provided by the HEER Office. Soil in the 0-4 feet bgs interval would be encountered during common residential subsurface activities, such as planting trees, gardening, and utility work.

An overview of the specific iterative approach for each of these DUs is described below.

DU1 to DU4, DU6 to DU11, DU13, and DU16:

- The soil samples from Layers A to C (the top three layers to be evaluated) were analyzed initially. The soil samples for the remaining layers were archived at the laboratory until the analytical results for Layers A to C were reviewed. Pending these analytical results and discussion with the HEER Office, subsequent layers were analyzed iteratively until either:
    - All COPC are below the screening criteria; or
    - All layers have been analyzed; or
    - The HEER Office recommends that no further analysis is necessary.

- The decision to analyze subsequent layers was based on the detected concentrations of total arsenic or on the recommendations of the HEER Office. If the initial soil samples from Layers A to C had any detected concentrations of total arsenic exceeding the screening criteria, the subsequent layer(s) were analyzed iteratively. In some cases, the HEER Office recommended that a subsequent layer(s) be analyzed iteratively, independent of the total arsenic concentrations.

DU5, DU12, DU14, DU15, and DU17:

- The soil samples from Layers B to C (the top two layers to be evaluated) were analyzed initially. The soil samples for the remaining layers were archived until the analytical results for Layers B to C were reviewed. Pending these analytical results and discussion with the HEER Office, subsequent layers were analyzed iteratively until either:
    - All COPC are below the screening criteria; or
    - All layers have been analyzed; or
    - The HEER Office recommends that no further analysis is necessary.
- The decision to analyze subsequent layers was based on the detected concentrations of total arsenic or on the recommendations of the HEER Office. If the initial soil samples from Layers B to C had any detected concentrations of total arsenic exceeding the screening criteria, the subsequent layer(s) were analyzed iteratively. In some cases, the HEER Office recommended that a subsequent layer(s) be analyzed iteratively, independent of the total arsenic concentrations.

The specific COPC that each sample was analyzed for depended on the DU and the layer. Tables 15 and 16 have detailed information regarding the field and IDW samples.

Table 15 – Field Sample Information

Location ID[1]	Site Area	Number of Borings per DU	Feet per Boring	Total Feet per DU	Sample Type	Samples from Layer A (0-0.5' bgs)	Samples from Layer B (0.5'-2' bgs)	Samples from Layer C (2'-4' bgs)	Samples from Layer D (4'-7' bgs)	Samples from Layer E (7'-10' bgs)	Total Number of Samples Collected	Sample Status[2] (Analyzed/on Hold)	COPC Category	Comments
DU1	Area 1	5	10	50	LC	1	1	1	1	1	**5**	Layers Analyzed: A to C Layers on Hold: D and E	Primary COPC	
DU2	Area 1	5	10	50	LC	1	1	1	1	1	**5**	Layers Analyzed: A to D Layers on Hold: E	Primary COPC	
DU3	Area 1	5	10	50	LC	1	1	1	1	1	**5**	Layers Analyzed: A to C Layers on Hold: D and E	Primary COPC	
DU4	Area 1	7	10	70	LC	3	3	3	3	3	**15**	Layers Analyzed: A to D Layers on Hold: E	Primary COPC	Triplicate.
DU5	Area 1	5	10	50	LC	1	1	1	1	1	**5**	Layers Analyzed: B to E Layers on Hold: A	Primary COPC	
DU6	Area 1	5	10	50	MI & LC	3	3	3	3	3	**15**	Layers Analyzed: A to C Layers on Hold: D and E	Primary COPC	Triplicate.
DU7	Area 1	5	10	50	MI & LC	1	1	1	1	1	**5**	Layers Analyzed: A to C Layers on Hold: D and E	Primary COPC	
DU8	Area 1	5	10	50	LC	1	1	1	1	1	**5**	Layers Analyzed: A to C Layers on Hold: D and E	Primary COPC	
DU9	Area 1	7	10	70	LC	1	1	1	1	1	**5**	Layers Analyzed: A to C Layers on Hold: D and E	Primary COPC	
DU10	Area 2	5	10	50	LC	1	1	1	1	1	**5**	Layers Analyzed: A to E Layers on Hold: None	Primary COPC, Waste Categorization COPC, Other COPC[3]	
DU11	Area 2	5	10	50	LC	1	1	1	1	1	**5**	Layers Analyzed: A to C Layers on Hold: D and E	Primary COPC & Other COPC[3]	
DU12	Area 2	6	10	60	LC	1	1	1	1	1	**5**	Layers Analyzed: B to E Layers on Hold: A	Primary COPC & Waste Categorization COPC	
DU13	Area 2	3	10	30	LC	1	1	1	1	1	**5**	Layers Analyzed: A to D Layers on Hold: E	Primary COPC & Waste Categorization COPC	
DU14	Area 2	3	10	30	LC	1	1	1	1	1	**5**	Layers Analyzed: B to D Layers on Hold: A and E	Primary COPC & Waste Categorization COPC	
DU15	Area 2	3	10	30	LC	1	1	1	1	1	**5**	Layers Analyzed: B to D Layers on Hold: A and E	Primary COPC & Waste Categorization COPC	
DU16	Area 2	3	10	30	LC	1	1	1	1	1	**5**	Layers Analyzed: A to D Layers on Hold: E	Primary COPC & Waste Categorization COPC	
DU17	Area 2	4	10	40	LC	1	1	1	1	1	**5**	Layers Analyzed: B to D Layers on Hold: A and E	Primary COPC & Waste Categorization COPC	
DU18	Area 2	0	0	0	MI	3	0	0	0	0	**3**	Layers Analyzed: A Layers on Hold: None	Primary COPC	Triplicate.
DU19	Area 2	0	0	0	MI	1	0	0	0	0	**1**	Layers Analyzed: A Layers on Hold: None	Primary COPC	
DU21	Area 3	0	0	0	MI	1	0	0	0	0	**1**	Layers Analyzed: A Layers on Hold: None	Primary COPC	
DU22	Area 3	0	0	0	MI	1	0	0	0	0	**1**	Layers Analyzed: A Layers on Hold: None	Primary COPC	
DU23	Area 3	0	0	0	MI	1	0	0	0	0	**1**	Layers Analyzed: A Layers on Hold: None	Primary COPC	

Location ID[1]	Site Area	Number of Borings per DU	Feet per Boring	Total Feet per DU	Sample Type	Samples from Layer A (0-0.5' bgs)	Samples from Layer B (0.5'-2' bgs)	Samples from Layer C (2'-4' bgs)	Samples from Layer D (4'-7' bgs)	Samples from Layer E (7'-10' bgs)	Total Number of Samples Collected	Sample Status[2] (Analyzed/on Hold)	COPC Category	Comments
DU24	Area 4	0	0	0	MI	3	0	0	0	0	**3**	Layers Analyzed: A Layers on Hold: None	Primary COPC	Triplicate.
DU25	Area 4	0	0	0	MI	1	0	0	0	0	**1**	Layers Analyzed: A Layers on Hold: None	Primary COPC	
DU26	Area 5	7	10	70	LC	0	0	1	0	0	**1**	Layers Analyzed: Observed Debris Layer Layers on Hold: None	Full PMA COPC	Samples were only collected from the observed debris layer (typically 3-4.5' bgs), as identified in field.
DU27	Area 5	8	10	80	LC	0	0	1	0	0	**1**	Layers Analyzed: Observed Debris Layer Layers on Hold: None	Full PMA COPC	Samples were only collected from the observed debris layer (typically 3-4.5' bgs), as identified in field.
TOTALS	--	**96**	--	**960**	--	**32**	**21**	**23**	**21**	**21**	**118**	--	--	--

NOTES:

1 = See Figures 7 and 8 for DU locations

2 = Initially all layers down to Layer C were analyzed by the laboratory. Pending these results, subsequent layers will be analyzed iteratively until either 1) All COPC are below the screening criteria; or 2) All layers have been analyzed; or 3) The HEER Office recommends that no further analysis is necessary. See Section 7.2 for further details.

3 = The samples from DU10 and DU11 were also analyzed for other COPC, including VOC, SVOC, and chlorinated herbicides. The decision to include these other COPC was made by the HEER Office and was based on the presence of petroleum-impacted soil in the field.

' bgs = Feet below ground surface

LC = Layer composite

MI = Multi-increment

Table 16 – IDW Sample Information

Sample ID	Site Area[1]	Sample Type	Total Number of Samples Collected	COPC Category	Comments
PMAK-Area 1,3,4-WC	Area 1, 3, and 4	MI	**1**	Waste Categorization COPC	From the remaining soil cuttings from DU1 to DU9 and DU21 to DU25.
PMAK-Area 2-WC	Area 2	MI	**1**	Waste Categorization COPC	From the remaining soil cuttings from DU10 to DU19.
PMAK-Area 5-WC	Area 5	MI	**1**	Waste Categorization COPC	From the remaining soil cuttings from DU26 and DU27.
TOTALS	--	--	**3**	--	--

NOTES:
MI = Multi-increment
1 = See Figures 7 and 8 for Area and DU locations

7.3 Sample Identification

All samples were labeled with a project-specific identification (ID) number upon collection. The sample ID formatting scheme is:

A-B-C-D

Where:

A Specifies the site, (PMAK)

B Specifies the DU

C Specifies the layer

D Specifies the field QC sample type, if applicable

The sample ID formatting scheme in Table 17.

Table 17 – Sample Identification Formatting Scheme

Identifier	Meaning
PMAK	Kilauea Sugar Company, Ltd. Mill PMA
DU#	Decision Unit
A	Layer A
B	Layer B
C	Layer C
D	Layer D
E	Layer E
P	Primary Sample
T1 or T2	Triplicate Sample
WC	Waste Characterization - IDW Sample

Since 1-gallon Ziploc bags were the only sample containers used during the site investigation, adhesive sample labels were not necessary as information was recorded directly on the Ziploc bag using a permanent marker with indelible ink. Each Ziploc bag was labeled with the following relevant sample information:

- Project name and location or identifier
- Sample ID
- Date and time of collection
- Company performing sampling
- Sample collector's initials

The sample ID for each sample was recorded in the field log forms and chain-of-custody documents. The chain-of-custody documents are in Appendix B.

7.4 Sample Handling and Chain of Custody

After each sample was collected and labeled, it was placed in a cooler. The sample coolers were chilled with a combination of wet ice, dry ice, and frozen gel ice packs to maintain a temperature of 4 degrees Celsius (°C). All samples were logged on chain-of-custody documents that were stored in a sealed Ziploc bag in the sample coolers. The sample coolers were transported from the site to the field team's hotel at the end of each workday.

The sample coolers were transported from Kauai to Test America's laboratory in Aiea, Hawaii, (Test America Honolulu) by Aloha Air Cargo. Samples shipments were timed to allow the laboratory to meet holding times for analysis. Four sample cooler shipments were made during the field activities (two shipments per week).

Several laboratories were used to analyze the soil samples. The Test America Honolulu laboratory was the primary laboratory for the site investigation. All sample shipments were directed to Test America Honolulu location initially. Following the sample preparation, Test America Honolulu transferred the samples to the appropriate laboratories. Table 18 lists the laboratories.

Table 18 – Project Laboratories

Laboratory	Location	Analysis Method # Performed	COPC
Primary Laboratory			
Test America Honolulu	Aiea, Hawaii	8270	SVOC
		8260	VOC
		8015	TPH-DRO and TPH-RRO
		6010	Total Metals
		7471	Mercury
		PBET	Bioaccessible Arsenic
		9045	pH
		8081	Organochlorine Pesticides
Additional Laboratories			
Test America Denver	Arvada, Colorado	6010	Total Metals
		7471	Mercury
		8151	Chlorinated Herbicides
		6010	Total Metals
		7471	Mercury
Test America West Sacramento	Sacramento, California	8290	TEQ Dioxins
Test America Irvine	Irvine, California	8081	TCLP Organochlorine Pesticides
		6010	TCLP Metals
		7470	TCLP Mercury
Test America Seattle	Seattle, Washington	6010	Total Metals
		7471	Mercury
Anatek Labs	Moscow, Idaho	8151	Chlorinated Herbicides
		8321	Carbamate Herbicides
		8270	Modified Pesticide Screen

7.5 Analytical Methods

Analysis of all project samples was conducted by accredited laboratories that were able to meet the project analytical and QA/QC requirements. Generally, the analytical methods selected for the site investigation were standard EPA methods from EPA SW-846 Test Methods for Evaluating Solid Waste (EPA 2011).

Bioaccessible arsenic was analyzed using the PBET method (Naval Facilities Engineering Command (NAVFAC), User's Guide UG-2041-ENV [NAVFAC 2009]).

Flammability was analyzed using ASTM International (ASTM) D4986 Standard Test Method for Horizontal Burning Characteristics of Cellular Polymeric Materials (ASTM 2011).

All soil samples were prepared following the multi-increment preparation procedures outlined in Section 4.2.2 of the HEER Office TGM (HEER Office 2011c). Table 19 lists the laboratory analytical methods used to evaluate the soil samples.

Table 19 – Analytical Methods

COPC	Analysis Method #	Analysis Methodology	Method Reference
Primary COPC			
TEQ Dioxins	8290	GC/MS	SW-846
Total Arsenic	6010	ICP-AES	SW-846
Bioaccessible Arsenic	PBET	PBET	UG-2041-ENV
Mercury	7471	CV-AA	SW-846
Lead	6010	ICP-AES	SW-846
Pentachlorophenol	8270	GC/MS	SW-846
TPH-DRO and TPH-RRO	8015	GC/FID	SW-846
Full PMA COPC			
TEQ Dioxins	8290	GC/MS	SW-846
TPH-DRO and TPH-RRO	8015	GC/FID	SW-846
Organochlorine Pesticides	8081	GC/MS	SW-846
Chlorinated Herbicides	8151	GC-M or GC-PD	SW-846
SVOC	8270	GC/MS	SW-846
Modified Pesticide Screen	8270	GC/MS	SW-846
Carbamate Herbicides	8321	HPLC/TS/MS or UV	SW-846
Total Metals	6010 and 7471	ICP-AES and CV-AA	SW-846
Waste Categorization COPC			
TCLP Organochlorine Pesticides	8081	GC/MS	SW-846
TCLP Metals	6010 and 7470	ICP-AES and CV-MT	SW-846
pH	9045	EM-pH	SW-846
Flammability	ASTM D4986	ASTM D4986	ASTM D4986
Other COPC			
VOC	8260	GC/MS	SW-846
SVOC	8270	GC/MS	SW-846
Chlorinated Herbicides	8151	GC-M or GC-PD	SW-846
Supplemental Analytical Methods			
Multi-increment Prep[1]	HEER Office TGM	HEER Office TGM	HEER Office TGM

NOTES:
AD/MAD = Acid digestion/microwave-assisted acid digestion
CV-AA = Cold vapor-atomic absorption
CV-MT = Cold vapor-manual technique
EM-pH = Electrometric-pH meter
GC/FID = Gas chromatography/flame ionization detector
GC/MS = Gas chromatography/mass spectrometry
GC-M = Gas chromatography-methylation
GC-PD = Gas chromatography-pentafluorbenyzlation derivatization
HPLC/TS/MS = High-performance liquid chromatography/thermospray/mass spectrometry
ICP-AES = Inductively coupled plasma-atomic emission spectroscopy
PBET = Physiologically-based extraction test
TCLP = Toxicity characteristic leaching procedure
UV = Ultraviolet detection
1 = All soil samples collected during the site investigation were prepared following the multi-increment preparation procedures outlined Section 4.2.2 of the HEER Office TGM.

7.6 Sample Containers and Holding Times

The type of sample container used for each analysis, the sample volumes required, the preservation requirements, and the maximum holding times for sample extraction and analysis are in Table 20.

Table 20 – Sample Containers, Preservatives, and Holding Times

COPC	Analysis Method #	Sample Volume	Sample Container	Preservative	Holding Time
Primary COPC					
TEQ Dioxins	8290	1 kg	1-gallon Ziploc	Cool, 4 °C	28 days
Total Arsenic	6010	1 kg	1-gallon Ziploc	Cool, 4 °C	180 days
Bioaccessible Arsenic	PBET	1 kg	1-gallon Ziploc	Cool, 4 °C	10 days
Mercury	7471	1 kg	1-gallon Ziploc	Cool, 4 °C	28 days
Lead	6010	1 kg	1-gallon Ziploc	Cool, 4 °C	180 days
Pentachlorophenol	8270	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
TPH-DRO and TPH-RRO	8015	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
Full PMA COPC					
TEQ Dioxins	8290	1 kg	1-gallon Ziploc	Cool, 4 °C	28 days
TPH-DRO and TPH-RRO	8015	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
Organochlorine Pesticides	8081	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
Chlorinated Herbicides	8151	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
SVOC	8270	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
Modified Pesticide Screen	8270	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
Carbamate Herbicides	8321	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
Total Metals	6010 and 7471	1 kg	1-gallon Ziploc	Cool, 4 °C	28 days
Waste Categorization COPC					
TCLP Organochlorine Pesticides	8081	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
TCLP Metals	6010 and 7470	1 kg	1-gallon Ziploc	Cool, 4 °C	28 days
pH	9015	1 kg	1-gallon Ziploc	Cool, 4 °C	7 days
Flammability	ASTM D4986	1 kg	1-gallon Ziploc	Cool, 4 °C	28 days
Other COPC					
VOC	8260	1 kg	1-gallon Ziploc[1]	Cool, 4 °C[1]	2 days[1]
SVOC	8270	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days
Chlorinated Herbicides	8151	1 kg	1-gallon Ziploc	Cool, 4 °C	14 days

NOTES:
°C = Degrees Celsius
kg - Kilogram

1 = The recommended sample containers and preservatives for VOC analysis (per EPA Method 8260 and the HEER Office TGM) were not utilized, because they were unavailable in the field. These items were unavailable because no samples were initially planned for VOC analysis and thus the laboratory did not supply the recommended sample containers and preservatives. See Section 7.7 for further details.

7.7 Deviations from the Sampling and Analysis Plan

- The SAP identified three DUs in the West Drainage Outfall (DU18 to DU20). DU20, northwest of DU19, was eliminated after the SAP was finalized based on available information regarding current and historical operations in the West Drainage Outfall. The DU ID numbers were not altered to reflect the deletion of DU20, because all of the project plans and figures had already been completed.

- The SAP identified DU19 to be directly adjacent to DU18 and DU20. After eliminating DU20, DU19 was relocated farther downgradient in the West Drainage Outfall, nearer the point where the natural valley starts. The final location of DU19 was determined in the field, based on site conditions. DU19 was approximately 0.42 mile northwest of DU18, near the access road.
- The SAP identified DU18 to be 100 yards long; however, due to the presence of large boulders and other debris in the northwest end of this DU, the length was decreased to approximately 50 yards.
- The SAP did not include pentachlorophenol in the primary COPC category. At the request of the HEER Office, pentachlorophenol was added to the primary COPC category.
- Samples from Area 2 for Layers A to E were analyzed for pH initially due to the relatively short holding time (7 days) for this analytical method. This did not follow the iterative approach prescribed in the SAP. This change was implemented to ensure the pH analysis was completed within the recommended holding time.
- The SAP did not identify samples from DU10 and DU11 to be analyzed for the other COPC category (VOC, SVOC, chlorinated herbicides). The HEER Office requested that DU10 and DU11 be analyzed for the other COPC category based on presence of petroleum-impacted soil. Because this decision was made in the field, the recommended sample containers and preservatives for VOC analysis (per EPA Method 8260 and the HEER Office TGM) were not used, because they were unavailable. These items were unavailable because no samples were initially planned for VOC analysis; therefore, the laboratory did not supply the recommended sample containers and preservatives. Upon receipt of the DU10 and DU11 samples at the laboratory, Test America Honolulu collected 5-gram aliquots for the VOC analysis using methanol as a preservative before the drying and sieving procedures for the multi-increment preparation began. It is Tetra Tech's opinion that the resulting data quality for DU10 and DU11 is still representative, but should be considered estimated.
- The SAP identified DU5 and DU26 to be on the eastern borders of the Ortal and Foley properties, adjacent to the HHA property. Due to the presence of a septic tank on the Ortal property, and a terraced garden with mature vegetation, DU5 and DU26 were relocated to the east, on the HHA property, directly abutting the Ortal and Foley properties.
- The SAP did not identify samples from multiple layers from DU10 to be analyzed for the waste categorization COPC. The SAP noted that only the individual layer with the highest detected concentration of primary COPC to be analyzed for the waste categorization COPC. The HEER Office decided to analyze multiple layers for the waste categorization COPC.
- The SAP identified analysis for bioaccessible arsenic for samples from Layer A that have a detected concentration of total arsenic greater than the Tier I EAL (>20 mg/kg). At the request of the HEER Office, several samples from Layers B and C were also analyzed for bioaccessible arsenic.
- The SAP did not identify any samples to be analyzed for TPH-DRO and TPH-RRO, except those from DU10 to DU17. The samples from DU4 Layers A to C were analyzed for TPH-DRO and TPH-RRO. This decision was based on the field observation of petroleum-impacted soil.

- The SAP did not identify samples to be collected from Layer A in DU5 to DU7, DU10 to DU12, DU14, DU15, and DU17. This was because there was existing analytical data from Layer A in these areas and DUs from the previous HEER Office samplings. Because the collection of samples from Layer A did not require any additional efforts in the field, the project team decided to collect samples from Layer A in DU5 to DU7, DU10 to DU12, DU14, DU15, and DU17. These samples were archived at the laboratory upon receipt; they were not initially analyzed. The first sample interval submitted for analysis in each of these DUs was Layer B, with the exception of DU10 and DU11. Based on the field observation of petroleum-impacted soil, the HEER Office requested that Layer A from DU10 and DU11 be analyzed.
- The SAP identified pH analysis to be conducted by EPA Method 9015; however, all pH analysis was conducted by EPA Method 9045. Test America Honolulu indicated that their laboratory typically performs all pH analysis for soil samples using EPA Method 9045. This is not considered a significant deviation as both methods are approved and accepted methods for pH analysis.

The deviations identified did not have an effect on the DQOs or project goals. All deviations were identified based on field conditions and for gathering additional, relevant information.

8 Data Presentation and Analytical Results

8.1 Screening Criteria

The analytical results were compared with the HEER Office's Tier I EALs for soils on unrestricted use and commercial or industrial use sites (depending on current property use), where potentially impacted groundwater is not a current or potential drinking water resource, and with surface water bodies more than 150 meters from the site (HEER Office 2011b). The HDOH SDWB confirmed that the site was on the seaward side of the UIC line. Groundwater inland of the UIC line is considered a potential drinking water source. Groundwater seaward of the UIC line is considered as non-potable and saline.

The specific screening criteria used for each DU depended on the property use, and is listed in Table 21.

Table 21 – Screening Criteria Used for Each DU

Location ID	Property Usage	Screening Criteria Used
DU1	Commercial	U[1]
DU2	Single Family Homes	U
DU3	Single Family Homes	U
DU4	Single Family Homes	U
DU5	Apartment Facility	U
DU6	Apartment Facility	U
DU7	Apartment Facility	U
DU8	Commercial	C/I
DU9	Commercial	C/I
DU10	Commercial	C/I
DU11	Commercial	C/I
DU12	Single Family Home	U
DU13	Single Family Home	U
DU14	Single Family Home	U
DU15	Single Family Home	U
DU16	Single Family Home	U
DU17	Single Family Home	U
DU18	Vacant, Undeveloped Land	U[2]
DU19	Vacant, Undeveloped Land	U[2]
DU21	Commercial	C/I
DU22	Commercial	C/I
DU23	Commercial	C/I
DU24	Single Family Home	U
DU25	Single Family Home	U
DU26	Apartment Facility	U
DU27	Apartment Facility	U

NOTES:
C/I = Commercial/Industrial Use
U = Unrestricted Use
1 = DU1 is located on the North Shore Health Center property. Although the property is zoned for Commercial Use, the more conservative Unrestriced Use screening criteria were utilized for DU1 due to the potential for sensitive receptors (e.g., elderly) at the property.
2 = DU18 and DU19 are located in the West Drainage Outfall, which ultimately discharges to the Pacific Ocean at "Secret Beach." Due to the potential for ecological impacts at "Secret Beach," the more conservative Unrestricted Use screening criteria were utilized for DU18 and DU19.

8.2 Sample Results

The complete laboratory analytical data reports are in Appendix B. This section summarizes the field sample results for the 26 DUs. Table 22 has a summary of the field sample results for the primary COPC and other COPC categories. These results are also shown on Figures 10 and 11. Figure 10 shows the samples with COPC exceedances of the applicable HEER Office Tier I EALs for Areas 1, 3, and 4. Figure 11 shows the samples with COPC exceedances of the applicable HEER Office Tier I EALs for Areas 2 and 5. Table 23 has a summary of the field sample results for the waste categorization COPC; these results are reported in a separate table due to the use of different screening criteria.

Table 22 – Soil Sample Results for primary COPC and other COPC (16 pages)

DU1 Area 1 - Perimeter of Core PMA Along the eastern border of the North Shore Health Center Property	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	KSPMA-DU5	PMAK-DU1-A	PMAK-DU1-B	PMAK-DU1-C	PMAK-DU1-D	PMAK-DU1-E
Sample Date			12.16.10	8.1.11	8.1.11	8.1.11	8.1.11	8.1.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)								
TEQ DIOXINS	240	1500	140	120	160	NA[2]	NA[3]	NA[3]
Soil Analyses (mg/kg)								
TOTAL ARSENIC	24	24	**39.1**	**38**	**37.8**	ND [<9.26]	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	7.95	ND [<1]	6.11	NA	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	5.74	NA	7.16	NA	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	138	NA	85.3	NA	NA[3]	NA[3]
MERCURY	4.7	61	1.12	1.09	1.9	0.309	NA[3]	NA[3]
LEAD	200	800	125	119	**1070**	**246**	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.05]	ND [<0.310]	ND [<0.307]	ND [<0.313]	NA[3]	NA[3]
TA Job No.	HUH0012 and HUI0095							

DU2 Area 1 - Perimeter of Core PMA Along the eastern borders of the Grace Paul Trust property, Clarion property and Howard property; adjacent to Aalona St.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	KSPMA-DU2	KSPMA-DU3	PMAK-DU2-A	PMAK-DU2-B	PMAK-DU2-C	PMAK-DU2-D	PMAK-DU2-E
Sample Date			12.15.10	12.15.10	8.1.11	8.1.11	8.1.11	8.1.11	8.1.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)									
TEQ DIOXINS	240	1500	94	87	21	87	11	NA[2]	NA[3]
Soil Analyses (mg/kg)									
TOTAL ARSENIC	24	24	**93.9**	**33.8**	15.4	**55.4**	**114**	17	NA[3]
BIOACCESSIBLE ARSENIC	23	95	9.98	4.6	NA	15.1	49.6	NA[2]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	4.27	4.88	NA	11.5	18	NA[2]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	234	94.2	NA	131	276	NA[2]	NA[3]
MERCURY	4.7	61	0.969	0.776	0.23	0.966	0.474	0.63	NA[3]
LEAD	200	800	84	65.5	ND [<19.5]	118	**1380**	130	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.05]	ND [<0.05]	ND [<0.315]	ND [<0.316]	ND [<0.329]	ND [<0.325]	NA[3]
TA Job No.	HUH0012, HUI0095, and HUL0004								

LEGEND

Red Text = Detected concentration exceeds the HEER Office Tier I EAL for Unrestricted Use only.
Red Bold Text = Detected concentration exceeds the HEER Office Tier I EALs for both Unrestricted and Commercial/Industrial Use.
mg/kg = milligrams per kilogram (parts per million [ppm] equivalent)
ng/kg = nanograms per kilogram (parts per trillion [ppt] equivalent)
NA = Not analyzed
NA[2] = Not analyzed per SAP
NA[3] = Not analyzed because concentration of COPC(s) in overlying layer(s) was(were) below applicable EALs
ND = Not detected at or above the limit shown in brackets

NE = Not established
H = Sample is on "hold" and was archived at the laboratory.
[1] = Triplicate Sample
Shading = Sample collected during current site investigation
Shading = Sample collected during previous sampling activities (HEER Office or Kauai Environmental)
Shading = The specific Tier I EALs used during the screening (based on current property usage)
EAL = Envrionmental Action Level

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Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU3 **Area 1 - Perimeter of Core PMA** Along the eastern borders of the Johnson property, Deforge property, and the southern borders of the Cooper property, Cudiamat property, and Owens property; adjacent to the cul-de-sac portion of Aalona St.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**KSPMA-DU1**	**KSPMA-DU4**	**PMAK-DU3-A**	**PMAK-DU3-B**	**PMAK-DU3-C**	**PMAK-DU3-D**	**PMAK-DU3-E**
Sample Date			12.15.10	12.15.10	8.2.11	8.2.11	8.2.11	8.2.11	8.2.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)									
TEQ DIOXINS	240	1500	170	55	64	130	NA[2]	NA[3]	NA[3]
Soil Analyses (mg/kg)									
TOTAL ARSENIC	24	24	19.8	12.5	11	**28**	ND [<6.0]	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA	NA	NA[2]	4.04	NA[2]	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	NA	NA[2]	3.15	NA[2]	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA	NA	NA[2]	129	NA[2]	NA[3]	NA[3]
MERCURY	4.7	61	0.569	0.416	0.44	0.82	0.49	NA[3]	NA[3]
LEAD	200	800	32.1	21	25	28	6.8	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.05]	ND [<0.05]	ND [<1.62]	ND [<0.318]	ND[<0.325]	NA[3]	NA[3]
TA Job No.	HUH0028 and HUI0096								

DU4[1] **Area 1 - Perimeter of Core PMA**Along the southern border of the Ortal property, adjacent to the Foley property.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**PMAK-DU4-A-P**	**PMAK-DU4-A-T1**	**PMAK-DU4-A-T2**	**PMAK-DU4-B-P**	**PMAK-DU4-B-T1**	**PMAK-DU4-B-T2**	**PMAK-DU4-C-P**	**PMAK-DU4-C-T1**	**PMAK-DU4-C-T2**	**PMAK-DU4-D-P**	**PMAK-DU4-D-T1**	**PMAK-DU4-D-T2**	**PMAK-DU4-E-P**	**PMAK-DU4-E-T1**	**PMAK-DU4-E-T2**
Sample Date			8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0.5-2.0	0.5-2.0	0.5-2.0	2.0-4.0	2.0-4.0	2.0-4.0	4.0-7.0	4.0-7.0	4.0-7.0	7.0-10.0	7.0-10.0	7.0-10.0
Soil Analyses (ng/kg)																	
TEQ DIOXINS	240	1500	170	190	180	120	170	110	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]
Soil Analyses (mg/kg)																	
TOTAL ARSENIC	24	24	18	18	17	**24**	**26**	**33**	13	16	12	ND [<5.7]	ND [<5.8]	ND [<6.1]	NA[3]	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA[2]	NA[2]	NA[2]	18.8	17.3	**23.8**	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA[2]	NA[2]	NA[2]	21.9	17.7	21.9	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA[2]	NA[2]	NA[2]	85.9	97.9	108	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]
MERCURY	4.7	61	0.99	0.91	0.84	0.54	0.62	0.52	0.55	0.52	0.47	0.34	0.36	0.44	NA[3]	NA[3]	NA[3]
LEAD	200	800	43	39	40	45	72	80	**2800**	**1400**	**1700**	16	24	20	NA[3]	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.325]	ND [<0.297]	ND [<0.320]	ND [<0.326]	ND [<0.322]	ND [<0.321]	ND [<0.325]	ND [<0.313]	ND [<0.322]	ND [<0.316]	ND [<0.318]	ND [<0.327]	NA[3]	NA[3]	NA[3]
TPH-DRO	500	500	35.8	32.7	32.4	259	164	151	275	181	179	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]
TPH-RRO	500	1000	165	125	121	182	298	303	303	264	182	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]
TA Job No.	HUH0028 and HUI0096																

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU5 **Area 1 - Perimeter of Core PMA** Along the western borders of the Ortal property and Foley property. This DU is adjacent to the HHA property.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**KKSC-DU1**	**KKSC-DU2**	**PMAK-DU5-A**	**PMAK-DU5-B**	**PMAK-DU5-C**	**PMAK-DU5-D**	**PMAK-DU5-E**
Sample Date			8.19.10	8.19.10	8.10.11	8.10.11	8.10.11	8.10.11	8.10.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)									
TEQ DIOXINS	240	1500	18	110	NA[2]	33	530	NA[2]	NA[2]
Soil Analyses (mg/kg)									
TOTAL ARSENIC	24	24	ND [<29]	ND [<30]	NA[2]	**28**	**880**	**500**	7.1
BIOACCESSIBLE ARSENIC	23	95	NA	NA	NA[2]	ND [<1.00]	61.6	NA[2]	NA[2]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	NA	NA[2]	ND [<0.200]	13.6	NA[2]	NA[2]
TOTAL ARSENIC (250 µm)	NE	NE	NA	NA	NA[2]	9.38	452	NA[2]	NA[2]
MERCURY	4.7	61	0.328	0.28	NA[2]	0.34	3.7	0.62	0.2
LEAD	200	800	17	15	NA[2]	14	170	84	6.3
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.05]	0.26	NA[2]	ND [<0.324]	0.362	ND [<0.326]	ND [<0.062]
TA Job No.	HUH0072 and HUL0004								

DU6[1] **Area 1 - Perimeter of Core PMA** Along the southern boundary of the HHA property, adjacent to Natural Bridges School property.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**PMAK-DU6-A-P**	**PMAK-DU6-A-T1**	**PMAK-DU6-A-T2**	**PMAK-DU6-B-P**	**PMAK-DU6-B-T1**	**PMAK-DU6-B-T2**	**PMAK-DU6-C-P**	**PMAK-DU6-C-T1**	**PMAK-DU6-C-T2**	**PMAK-DU6-D-P**	**PMAK-DU6-D-T1**	**PMAK-DU6-D-T2**	**PMAK-DU6-E-P**	**PMAK-DU6-E-T1**	**PMAK-DU6-E-T2**
Sample Date			8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0.5-2.0	0.5-2.0	0.5-2.0	2.0-4.0	2.0-4.0	2.0-4.0	4.0-7.0	4.0-7.0	4.0-7.0	7.0-10.0	7.0-10.0	7.0-10.0
Soil Analyses (ng/kg)																	
TEQ DIOXINS	240	1500	29	28	27	9.9	9.4	10	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
Soil Analyses (mg/kg)																	
TOTAL ARSENIC	24	24	18	15	16	ND[<5.6]	ND[<5.8]	ND[<5.9]	ND [<6.0]	ND [<5.8]	ND [<6.0]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
MERCURY	4.7	61	0.88	0.82	0.73	0.72	0.55	0.74	0.34	0.34	0.37	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
LEAD	200	800	150	160	140	27	25	27	13	15	12	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.320]	ND [<0.328]	ND [<0.314]	ND [<0.307]	ND[<0.327]	ND [<0.320]	ND [<0.318]	ND [<0.322]	ND [<0.320]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
TA Job No.	HUH0049																

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU7 **Area 1 - Perimeter of Core PMA** Along the southern boundary of the HHA property, adjacent to Natural Bridges School property.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU7-A	PMAK-DU7-B	PMAK-DU7-C	PMAK-DU7-D	PMAK-DU7-E
Sample Date			8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)			0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)							
TEQ DIOXINS	240	1500	86	83	NA[2]	NA[3]	NA[3]
Soil Analyses (mg/kg)							
TOTAL ARSENIC	24	24	13	ND [<5.8]	ND [<5.5]	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]
MERCURY	4.7	61	0.72	0.61	0.51	NA[3]	NA[3]
LEAD	200	800	140	54	42	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.325]	ND [<0.326]	ND [<0.325]	NA[3]	NA[3]
TA Job No.	HUH0049						

DU8 **Area 1 - Perimeter of Core PMA** Along the eastern border of the Old Mill LLC property, adjacent to the Natural Bridges School property.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU8-A	PMAK-DU8-B	PMAK-DU8-C	PMAK-DU8-D	PMAK-DU8-E
Sample Date			8.2.11	8.2.11	8.2.11	8.2.11	8.2.11
Depth Intervals (' bgs)			0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)							
TEQ DIOXINS	240	1500	29	63	NA[2]	NA[3]	NA[3]
Soil Analyses (mg/kg)							
TOTAL ARSENIC	24	24	**32**	7.9	ND [<5.8]	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	16.5	NA[2]	NA[2]	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	12.7	NA[2]	NA[2]	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	130	NA[2]	NA[2]	NA[3]	NA[3]
MERCURY	4.7	61	0.25	0.69	0.72	NA[3]	NA[3]
LEAD	200	800	72	160	240	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.325]	ND [<0.318]	ND [<0.320]	NA[3]	NA[3]
TA Job No.	HUH0028						

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU9 **Area 1 - Perimeter of Core PMA** Along the southern border of the Old Mill LLC property, adjacent to Oka Street.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**PMAK-DU9-A**	**PMAK-DU9-B**	**PMAK-DU9-C**	**PMAK-DU9-D**	**PMAK-DU9-E**
Sample Date			8.2.11	8.2.11	8.2.11	8.2.11	8.2.11
Depth Intervals (' bgs)			0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)							
TEQ DIOXINS	240	1500	31	41	NA[2]	NA[3]	NA[3]
Soil Analyses (mg/kg)							
TOTAL ARSENIC	24	24	8.8	12	ND [<5.7]	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA[2]	NA[2]	NA[2]	NA[3]	NA[3]
MERCURY	4.7	61	0.38	0.46	0.37	NA[3]	NA[3]
LEAD	200	800	69	270	130	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.325]	ND [<0.325]	ND [<0.326]	NA[3]	NA[3]
TA Job No.	HUH0028						

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU10 **Area 2 - Core PMA** Within the western portion of the Drainage Swale, which is along the northern border of the Old Mill LLC property.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	KSPMA-DU6	KSPMA-DU7	PMAK-DU10-A	PMAK-DU10-B	PMAK-DU10-C	PMAK-DU10-D	PMAK-DU10-E
Sample Date			12.15.10	12.16.10	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)									
TEQ DIOXINS	240	1500	**1700**	**2500**	NA[2]	**2100**	NA[2]	NA[2]	NA[2]
Soil Analyses (mg/kg)									
TOTAL ARSENIC	24	24	**1890**	**3760**	NA[2]	**6900**	**3800**	**2300**	**1800**
BIOACCESSIBLE ARSENIC	23	95	**786**	**1870**	NA[2]	**2860**	NA[2]	NA[2]	NA[2]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	24.8	27.1	NA[2]	22.9	NA[2]	NA[2]	NA[2]
TOTAL ARSENIC (250 µm)	NE	NE	3170	6890	NA[2]	12500	NA[2]	NA[2]	NA[2]
MERCURY	4.7	61	18.4	13.8	NA[2]	30	2.7	3.3	0.29
LEAD	200	800	288	420	NA[2]	290	96	43	ND
PENTACHLOROPHENOL (8270CM)	3	5	3.61	**7.13**	1.95	0.507	**11.9**	**11.7**	**13.3**
TPH-DRO	500	500	NA	NA	NA[2]	160	**4150**	**2470**	**8080**
TPH-RRO	500	1000	NA	NA	NA[2]	465	ND	**1680**	**4070**
pH	NE	NE	NA	NA	NA[2]	6.97	6.86	6.64	6.39
1,2,4-TRIMETHYLBENZENE	NE	NE	NA	NA	ND [<0.520]	ND [<0.468]	ND [<0.428]	1.52	ND [<0.428]
NAPHTHALENE (8260/8270)	0.46	1.9	0.064	0.24	ND [<0.520]/ ND [<0.322]	ND [<0.468]/0.507	0.672/1.32	1.21/1.20	0.526/**2.21**
1-CHLORONAPHTHALENE	NE	NE	NA	NA	ND [<0.322]	ND [<0.327]	ND [<0.307]	ND [<0.313]	3.53
1-METHYLNAPHTHALENE	2.6	11	0.081	0.16	ND [<0.322]	ND [<0.327]	**12.6**	**15.4**	**24.7**
2-METHYLNAPHTHALENE	25	50	0.18	0.39	ND [<0.322]	ND [<0.327]	19	17.2	16.1
4-AMINOBIPHENYL	NE	NE	NA	NA	ND [<0.645]	ND [<0.653]	0.966	1.2	ND [<0.658]
4-CHLOROANILINE	NE	NE	ND [<0.098]	ND [<0.096]	ND [<0.322]	ND [<0.327]	1.33	0.674	1.16
ACENAPHTHENE	140	140	ND [<0.02]	ND [<0.019]	ND [<0.322]	ND [<0.327]	1.22	1.98	3.67
ANTHRACENE	2.5	2.5	ND [<0.02]	0.56	ND [<0.322]	ND [<0.327]	0.569	0.853	1.51
DIBENZOFURAN	NE	NE	ND [<0.098]	ND [<0.096]	ND [<0.322]	ND [<0.327]	ND [<0.307]	0.393	ND [<0.329]
FLUORANTHENE	40	40	0.22	0.38	ND [<0.322]	ND [<0.327]	ND [<0.307]	ND [<0.313]	0.714
FLUORENE	130	130	ND [<0.02]	ND [<0.019]	ND [<0.322]	ND [<0.327]	1.44	2.28	4.712
N-NITROSODIPHENYLAMINE	NE	NE	ND [<0.049]	ND [<0.048]	ND [<0.322]	ND [<0.327]	ND [<0.307]	1.58	ND [<0.329]
PHENANTHRENE	18	18	0.14	0.26	ND [<0.322]	ND [<0.327]	5.79	8.16	14.3
PYRENE	56	56	0.25	0.47	ND [<0.322]	ND [<0.327]	0.316	0.472	0.915
2,4-D	NE	NE	0.0143	0.0313	NA	ND [<400]	ND [<309]	ND [<309]	ND [<400]
TA Job No.	HUH0049 and HUL0004								

NOTES: All other analyses for VOC 8260 and SVOC 8270 are ND.

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU11 **Area 2 - Core PMA** Within the eastern portion of the Drainage Swale. Along the northern border of the Old Mill LLC property.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**KSPMA-DU8**	**PMAK-DU11-A**	**PMAK-DU11-B**	**PMAK-DU11-C**	**PMAK-DU11-D**	**PMAK-DU11-E**
Sample Date			12.16.10	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)								
TEQ DIOXINS	240	1500	650	NA[2]	350	NA[2]	NA[3]	NA[3]
Soil Analyses (mg/kg)								
TOTAL ARSENIC	24	24	**317**	NA[2]	**66**	19	NA[3]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	**69.6**	NA[2]	9.19	NA[2]	NA[3]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	9.9	NA[2]	3.25	NA[2]	NA[3]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	703	NA[2]	283	NA[2]	NA[3]	NA[3]
MERCURY	4.7	61	11.1	NA[2]	4.3	1.4	NA[3]	NA[3]
LEAD	200	800	313	NA[2]	250	110	NA[3]	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	0.23	NA[2]	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
pH	NE	NE	NA	NA[2]	6.94	6.94	NA[3]	NA[3]
ANTHRACENE	2.5	2.5	0.09	0.745	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
BENZO (A) ANTRHACENE	1.5	13	0.43	2.02	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
BENZO (A) PYRENE	0.15	2.1	0.61	**2.11**	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
BENZO (B) FLUORANTHENE	1.5	12	0.93	2.59	0.344	ND [<0.302]	NA[3]	NA[3]
BENZO (G,H,I) PERYLENE	27	27	0.49	1.37	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
BENZO (K) FLUORANTHENE	15	40	0.3	0.85	0.39	ND [<0.302]	NA[3]	NA[3]
BUTYL BENZYL PHTHALATE	NE	NE	0.61	1.05	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
CHRYSENE	14	14	0.74	2.13	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
FLUORANTHENE	40	40	1.1	4.09	0.378	ND [<0.302]	NA[3]	NA[3]
INDENO (1,2,3-CD) PYRENE	1.5	21	0.41	1.1	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
PHENANTHRENE	18	18	0.7	0.975	ND [<0.328]	ND [<0.302]	NA[3]	NA[3]
PYRENE	56	56	1.1	3.31	0.384	ND [<0.302]	NA[3]	NA[3]
2,4-D	NE	NE	ND [<0.005]	NA[2]	ND [<390]	ND [<400]	NA[3]	NA[3]
TA Job No.	HUH0049							

NOTES: All other analyses for VOC 8260 and SVOC 8270 are ND.

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU12 **Area 2 - Core PMA** Within the front yard of the Thompson property, adjacent to Aalona Street.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	KKSC-DU5	PMAK-DU12-A	PMAK-DU12-B	PMAK-DU12-C	PMAK-DU12-D	PMAK-DU12-E
Sample Date			8.18.10	8.4.11	8.4.11	8.4.11	8.4.11	8.4.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)								
TEQ DIOXINS	240	1500	930	NA[2]	**1800**	NA[2]	NA[2]	NA[2]
Soil Analyses (mg/kg)								
TOTAL ARSENIC	24	24	**180**	NA[2]	**260**	**370**	**250**	**130**
BIOACCESSIBLE ARSENIC	23	95	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
TOTAL ARSENIC (250 µm)	NE	NE	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[2]
MERCURY	4.7	61	5.94	NA[2]	4.2	2.5	1.5	0.74
LEAD	200	800	680	NA[2]	130	230	260	78
PENTACHLOROPHENOL (8270CM)	3	5	0.3	NA[2]	0.613	2.25	ND [<0.317]	ND [<0.315]
TPH-DRO	500	500	NA	NA[2]	322	**1200**	**1470**	**1520**
TPH-RRO	500	1000	NA	NA[2]	**1320**	**2490**	**3330**	**1790**
pH	NE	NE	NA	NA[2]	7.5	7.28	7.2	7.21
TA Job No.	HUH0049 and HUL0004							

DU13 **Area 2 - Core PMA** Within the north side yard of the Thompson property, adjacent to Aalona Street	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU13-A	PMAK-DU13-B	PMAK-DU13-C	PMAK-DU13-D	PMAK-DU13-E
Sample Date			8.3.11	8.3.11	8.3.11	8.3.11	8.3.11
Depth Intervals (' bgs)			0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)							
TEQ DIOXINS	240	1500	760	1400	NA[2]	NA[2]	NA[3]
Soil Analyses (mg/kg)							
TOTAL ARSENIC	24	24	**75**	**46**	**26**	ND [<5.8]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
MERCURY	4.7	61	2.5	2.1	0.58	1.2	NA[3]
LEAD	200	800	90	54	220	48	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.321]	ND [<0.324]	ND [<1.60]	ND [<0.327]	NA[3]
pH	NE	NE	7.6	7.72	6.59	7.28	5.89
TA Job No.	HUH0028 and HUL0004						

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU14 **Area 2 - Core PMA** Within the backyard of the Thompson property adjacent to the Foley property.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	KKSC-DU6[3]	KKSC-DU7[3]	KKSC-DU8[3]	PMAK-DU14-A	PMAK-DU14-B	PMAK-DU14-C	PMAK-DU14-D	PMAK-DU14-E
Sample Date			8.18.10	8.18.10	8.18.10	8.4.11	8.4.11	8.4.11	8.4.11	8.4.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)										
TEQ DIOXINS	240	1500	817	1070	879	NA[2]	35	NA[2]	NA[2]	NA[3]
Soil Analyses (mg/kg)										
TOTAL ARSENIC	24	24	**520**	**770**	**430**	NA[2]	**1300**	**1500**	**230**	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA	**307**	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	18	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA	1700	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
MERCURY	4.7	61	15.4	28.2	45	NA[2]	0.4	0.32	5.0	NA[3]
LEAD	200	800	130	160	130	NA[2]	20	32	24	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	0.05	0.44	0.28	NA[2]	ND [<0.303]	ND [<0.307]	ND [<0.290]	NA[3]
pH	NE	NE	NA	NA	NA	NA[2]	6.91	6.77	7	7.16
TA Job No.	HUH0049 and HUL0004									

DU15 **Area 2 - Core PMA** Within the south side yard of the Thompson property, adjacent to the Drainage Swale.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	KKSC-DU6[3]	KKSC-DU7[3]	KKSC-DU8[3]	PMAK-DU15-A	PMAK-DU15-B	PMAK-DU15-C	PMAK-DU15-D	PMAK-DU15-E
Sample Date			8.18.10	8.18.10	8.18.10	8.4.11	8.4.11	8.4.11	8.4.11	8.4.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)										
TEQ DIOXINS	240	1500	817	1070	879	NA[2]	740	NA[2]	NA[2]	NA[3]
Soil Analyses (mg/kg)										
TOTAL ARSENIC	24	24	**520**	**770**	**430**	NA[2]	**2200**	**260**	**1100**	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA	**307**	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	18	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA	1700	NA	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
MERCURY	4.7	61	15.4	28.2	45	NA[2]	6.1	1.3	1.7	NA[3]
LEAD	200	800	130	160	130	NA[2]	**950**	**1300**	510	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	0.05	0.44	0.28	NA[2]	0.777	2.01	3.67	NA[3]
pH	NE	NE	NA	NA	NA	NA[2]	7.3	7.84	7.4	NA[3]
TA Job No.	HUH0049 and HUL0004									

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU16 **Area 2 - Core PMA** Within the driveway of the Foley property, adjacent to the Thompson property.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU16-A	PMAK-DU16-B	PMAK-DU16-C	PMAK-DU16-D	PMAK-DU16-E
Sample Date			8.3.11	8.3.11	8.3.11	8.3.11	8.3.11
Depth Intervals (' bgs)			0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)							
TEQ DIOXINS	240	1500	120	260	NA[2]	NA[2]	NA[3]
Soil Analyses (mg/kg)							
TOTAL ARSENIC	24	24	17	22	**37**	ND [<5.4]	NA[3]
BIOACCESSIBLE ARSENIC	23	95	NA[2]	2.54	**28.1**	NA[2]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA[2]	3	21.2	NA[2]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	NA[2]	84.8	132	NA[2]	NA[3]
MERCURY	4.7	61	0.61	0.97	0.5	0.86	NA[3]
LEAD	200	800	24	78	190	83	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.322]	ND [<0.318]	ND [<0.326]	ND [<0.321]	NA[3]
pH	NE	NE	7.67	7.77	7.55	7.25	7.14
TA Job No.	HUH0028, HUI0096, and HUL0004						

DU17 **Area 2 - Core PMA** Within the backyard of the Foley property, adjacent to the Drainage Swale.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	KKSC-DU3	PMAK-DU17-A	PMAK-DU17-B	PMAK-DU17-C	PMAK-DU17-D	PMAK-DU17-E
Sample Date			8.19.10	8.5.11	8.5.11	8.5.11	8.5.11	8.5.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)								
TEQ DIOXINS	240	1500	299	NA[2]	400	NA[2]	NA[2]	NA[3]
Soil Analyses (mg/kg)								
TOTAL ARSENIC	24	24	**100**	NA[2]	**540**	**72**	**38**	NA[3]
BIOACCESSIBLE ARSENIC	23	95	18.1	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	6.56	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
TOTAL ARSENIC (250 µm)	NE	NE	276	NA[2]	NA[2]	NA[2]	NA[2]	NA[3]
MERCURY	4.7	61	1.44	NA[2]	15	0.63	0.69	NA[3]
LEAD	200	800	43	NA[2]	58	61	26	NA[3]
PENTACHLOROPHENOL (8270CM)	3	5	0.11	NA[2]	0.567	ND [<0.315]	ND [<0.321]	NA[3]
pH	NE	NE	NA	NA[2]	7.29	7.3	6.9	7.03
TA Job No.	HUH0049 and HUL0004							

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU18 **Area 2 - Core PMA** Within the West Drainage Outfall, adjacent to the intersection of Kilauea Road and Oka Street.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU18-A-P	PMAK-DU18-A-T1	PMAK-DU18-A-T2
Sample Date			8.10.11	8.10.11	8.10.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5
Soil Analyses (ng/kg)					
TEQ DIOXINS	240	1500	64	64	91
Soil Analyses (mg/kg)					
TOTAL ARSENIC	24	24	**50**	**47**	**49**
BIOACCESSIBLE ARSENIC	23	95	ND [<1.00]	ND [<1.00]	ND [<1.00]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	1.94	2.88	2.04
TOTAL ARSENIC (250 µm)	NE	NE	32.7	29.1	29.7
MERCURY	4.7	61	0.6	0.52	0.39
LEAD	200	800	55	55	56
PENTACHLOROPHENOL (8270CM)	3	5	ND [<1.58]	ND [<1.52]	ND [<1.59]
TA Job No.	HUH0072				

DU19 **Area 2 - Core PMA** Within the West Drainage Outfall, to the west of DU18.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU19-A
Sample Date			8.11.11
Depth Intervals (' bgs)			0-0.5
Soil Analyses (ng/kg)			
TEQ DIOXINS	240	1500	15
Soil Analyses (mg/kg)			
TOTAL ARSENIC	24	24	**24**
BIOACCESSIBLE ARSENIC	23	95	ND [<1.00]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	ND [<2.00]
TOTAL ARSENIC (250 µm)	NE	NE	16.1
MERCURY	4.7	61	0.6
LEAD	200	800	16
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.313]
TA Job No.	HUH0072		

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU21 **Area 3 - Potentially Impacted Exposed Surface Soils - Not Previously Sampled** Two separate areas on the Old Mill LLC property.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**PMAK-DU21-A**
Sample Date			8.10.11
Depth Intervals (' bgs)			0-0.5
Soil Analyses (ng/kg)			
TEQ DIOXINS	240	1500	NA
Soil Analyses (mg/kg)			
TOTAL ARSENIC	24	24	**130**
BIOACCESSIBLE ARSENIC	23	95	19.1
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	19.7
TOTAL ARSENIC (250 µm)	NE	NE	96.8
MERCURY	4.7	61	0.38
LEAD	200	800	180
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.325]
TA Job No.	HUH0072		

DU22 **Area 3 - Potentially Impacted Exposed Surface Soils - Not Previously Sampled** Along the western border of the Old Mill LLC property adjacent to the drainage swale.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**PMAK-DU22-A**
Sample Date			8.5.11
Depth Intervals (' bgs)			0-0.5
Soil Analyses (ng/kg)			
TEQ DIOXINS	240	1500	140
Soil Analyses (mg/kg)			
TOTAL ARSENIC	24	24	**60**
BIOACCESSIBLE ARSENIC	23	95	14.9
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	8.36
TOTAL ARSENIC (250 µm)	NE	NE	178
MERCURY	4.7	61	0.72
LEAD	200	800	54
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.281]
pH	NE	NE	7.45
TA Job No.	HUH0049 and HUL0004		

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU23 **Area 3 - Potentially Impacted Exposed Surface Soils - Not Previously Sampled** Within the raised planter box along the southern boundary of the Old Mill LLC property.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU23-A
Sample Date			8.10.11
Depth Intervals (' bgs)			0-0.5
Soil Analyses (ng/kg)			
TEQ DIOXINS	240	1500	45
Soil Analyses (mg/kg)			
TOTAL ARSENIC	24	24	**38**
BIOACCESSIBLE ARSENIC	23	95	ND [<1.00]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	ND
TOTAL ARSENIC (250 µm)	NE	NE	18.4
MERCURY	4.7	61	0.39
LEAD	200	800	200
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.329]
TA Job No.	HUH0072		

DU24 **Area 4 - Surrounding Properties** Within the front, back and side yards for the Sansevere property.	HDOH Tier I EAL (Unrestricted Use)	HDOH Tier I EAL (Commercial / Industrial Use)	PMAK-DU24-A-P	PMAK-DU24-A-T1	PMAK-DU24-A-T2
Sample Date			8.10.11	8.10.11	8.10.11
Depth Intervals (' bgs)			0-0.5	0-0.5	0-0.5
Soil Analyses (ng/kg)					
TEQ DIOXINS	240	1500	92	92	98
Soil Analyses (mg/kg)					
TOTAL ARSENIC	24	24	**290**	**230**	**230**
BIOACCESSIBLE ARSENIC	23	95	16.8	16.1	17.1
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	6.94	8.14	8.07
TOTAL ARSENIC (250 µm)	NE	NE	242	198	212
MERCURY	4.7	61	0.68	0.62	0.68
LEAD	200	800	180	130	130
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.317]	ND [<0.317]	ND [<0.319]
TA Job No.	HUH0072				

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU25 **Area 4 - Surrounding Properties** Within the front, back, and side yards of the Hadley property, south of Oka Street.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**PMAK-DU25-A**
Sample Date			8.11.11
Depth Intervals (' bgs)			0-0.5
Soil Analyses (ng/kg)			
TEQ DIOXINS	240	1500	39
Soil Analyses (mg/kg)			
TOTAL ARSENIC	24	24	**25**
BIOACCESSIBLE ARSENIC	23	95	ND [<1.00]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	ND [<2.00]
TOTAL ARSENIC (250 µm)	NE	NE	10.2
MERCURY	4.7	61	0.33
LEAD	200	800	71
PENTACHLOROPHENOL (8270CM)	3	5	ND [<0.318]
TA Job No.	HUH0072		

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU26 **Area 5 - HHA Debris Pit** Along the western borders of the HHA property, west of Building B.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**KKSC-DU1**	**KKSC-DU2**	**KBV-01**	**PMAK-DU26**
Sample Date			8.19.10	8.19.10	1.26.11	8.10.11
Depth Intervals (' bgs)			0-0.5	0-0.5	4.0-6.0	3.0-4.5
Soil Analyses (ng/kg)						
TEQ DIOXINS	240	1500	18	110	NA	24
Soil Analyses (mg/kg)						
TOTAL ARSENIC	24	24	ND [<29]	ND [<30]	**950**	**380**
BIOACCESSIBLE ARSENIC	23	95	NA	NA	NA	NA[2]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	NA	NA	NA[2]
TOTAL ARSENIC (250 µm)	NE	NE	NA	NA	NA	NA[2]
MERCURY	4.7	61	0.328	0.28	3.6	0.55
LEAD	200	800	17	15	240	340
PENTACHLOROPHENOL (8151/8270)	3	5	ND [<0.05]	0.26	**6.4**	ND [<0.01]/ ND [<0.314]
TPH-DRO	500	500	NA	NA	ND [<20]	42.7
TPH-RRO	500	1000	NA	NA	ND [<40]	243
BARIUM	750	1500	110	140	420	170
CADMIUM	12	12	ND[<4.8]	ND[<5.0]	3.3	1.8
CHROMIUM	500	500	220	220	42	410
SILVER	20	40	ND[<9.7]	ND[<9.9]	ND [<20]	0.33
BENZO(A)ANTHRACENE	1.5	13	ND [<0.16]	ND [<0.16]	0.41	0.317
BENZO(A)PYRENE	0.15	2.1	ND [<0.16]	ND [<0.16]	ND [<0.1]	0.344
BENZO(B)FLUORANTHENE	1.5	12	ND [<0.16]	ND [<0.16]	0.2	0.405
CHRYSENE	14	14	ND [<0.16]	ND [<0.16]	0.84	0.357
FLUORANTHENE	40	40	ND [<0.16]	ND [<0.16]	0.42	0.34
PYRENE	56	56	ND [<0.16]	ND [<0.16]	0.53	0.442
TA Job No.	HUH0072					

NOTES: All other analyses for organochlorine pesticides 8081, chlorinated herbicides 8151, SVOC 8270, modified pesticide screen 8270CMOD, carbamate herbicides 8321 and total metals 6010 are ND.

Table 22 – Soil Sample Results for primary COPC and other COPC (continued)

DU27 **Area 5 - HHA Debris Pit** Along the western border of the HHA property, south of Building B.	**HDOH Tier I EAL (Unrestricted Use)**	**HDOH Tier I EAL (Commercial / Industrial Use)**	**KKSC-DU2**	**PMAK-DU27**
Sample Date			8.19.10	8.9.11
Depth Intervals (' bgs)			0-0.5	3.0-4.5
Soil Analyses (ng/kg)				
TEQ DIOXINS	240	1500	110	370
Soil Analyses (mg/kg)				
TOTAL ARSENIC	24	24	ND [<30]	**170**
BIOACCESSIBLE ARSENIC	23	95	NA	NA[2]
PERCENT BIOACCESSIBLE ARSENIC	NE	NE	NA	NA[2]
TOTAL ARSENIC (250 µm)	NE	NE	NA	NA[2]
MERCURY	4.7	61	0.28	1.9
LEAD	200	800	15	**3300**
PENTACHLOROPHENOL (8151/8270)	3	5	0.26	ND [<0.01]/0.19
TPH-DRO	500	500	NA	42.8
TPH-RRO	500	1000	NA	161
BARIUM	750	1500	140	210
CADMIUM	12	12	ND[<5.0]	1.3
CHROMIUM	500	500	220	470
SILVER	20	40	ND[<9.9]	1
DELTA-BHC	NE	NE	0.00678	0.017
TA Job No.	HUH0072			

NOTES: All other analyses for organochlorine pesticides 8081, chlorinated herbicides 8151, SVOC 8270, modified pesticide screen 8270CMOD, carbamate herbicides 8321 and total metals 6010 are ND.

LEGEND

Red Text = Detected concentration exceeds the HEER Office Tier I EAL for Unrestricted Use only.

Red Bold Text = Detected concentration exceeds the HEER Office Tier I EALs for both Unrestricted and Commercial/Industrial Use.

mg/kg = milligrams per kilogram (parts per million [ppm] equivalent)

ng/kg = nanograms per kilogram (parts per trillion [ppt] equivalent)

NA = Not analyzed

NA[2] = Not analyzed per SAP

NA[3] = Not analyzed because concentration of COPC(s) in overlying layer(s) was(were) below applicable EALs

ND = Not detected at or above the limit shown in brackets

NE = Not established

H = Sample is on "hold" and was archived at the laboratory.

[1] = Triplicate Sample

Shading =	Sample collected during current site investigation
Shading =	Sample collected during previous sampling activities (HEER Office or Kauai Environmental)
Shading =	The specific Tier I EALs used during the screening (based on current property usage)

Fall 2011 Revised Tier I EALs

Table 23 – Soil Sample Results for Waste Categorization COPC (7 pages)

DU10 **Area 2 - Core PMA** Within the western portion of the Drainage Swale, which is along the northern border of the Old Mill LLC property.	**TCLP Screening Criteria**	**PMAK-DU10-B**	**PMAK-DU10-C**	**PMAK-DU10-D**	**PMAK-DU10-E**
Sample Date		8/8/2011	8/8/2011	8/8/2011	8/8/2011
Sample Depth		0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Soil Analyses (ng/kg)					
TEQ DIOXINS	NE	2100	NA	NA	NA
Soil Analyses (mg/L)					
TCLP TOTAL ARSENIC	5	**7.3**	3.9	ND[<0.060]	**12**
TCLP BARIUM	100	0.015	0.039	0.300	1.200
TCLP CADMIUM	1	ND [<0.010]	ND [<0.010]	ND [<0.010]	ND [<0.010]
TCLP CHROMIUM	5	ND [<0.025]	0.10	ND [<0.025]	ND [<0.025]
TCLP LEAD	5	ND [<0.030]	ND [<0.030]	ND [<0.030]	ND [<0.030]
TCLP SELENIUM	1	ND [<0.10]	ND [<0.10]	ND [<0.10]	ND [<0.10]
TCLP SILVER	5	ND [<0.020]	ND [<0.020]	ND [<0.020]	ND [<0.020]
TCPL MERCURY	0.2	ND [<0.0020]	ND [<0.0020]	ND [<0.0020]	ND [<0.0020]
TCLP ENDRIN	0.02	ND [<0.00020]	ND [<0.00020]	ND [<0.00020]	ND [<0.00020]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [<0.00010]	ND [<0.00010]	ND [<0.00010]	ND [<0.00010]
TCLP HEPTACHLOR	0.008	ND [<0.00010]	ND [<0.00010]	ND [<0.00010]	ND [<0.00010]
TCLP HEPTACHLOR EPOXIDE	NE	ND [<0.00010]	ND [<0.00010]	ND [<0.00010]	ND [<0.00010]
TCLP METHOXYCHLOR	10	ND [<0.0010]	ND [<0.0010]	ND [<0.0010]	ND [<0.0010]
TCLP CHLORDANE	0.03	ND [<0.0010]	ND [<0.0010]	ND [<0.0010]	ND [<0.0010]
TCLP TOXAPHENE	0.5	ND [<0.010]	ND [<0.010]	ND [<0.010]	ND [<0.010]
PH	NE	6.97	6.86	6.64	6.39
FLASHPOINT	NE	>212°F	>212°F	>212°F	>212°F
TA Job No.	HUH0049 and HUL0004				

LEGEND

Red Bold Text = Detected concentration exceeds the TCLP screening criteria

mg/l = milligrams per liter (parts per million [ppm] equivalent)

ng/kg = nanograms per kilogram (parts per trillion [ppt] equivalent)

NA = Not analyzed

ND = Not detected at or above the limit shown in brackets

NE = Not established

TCLP Screening Criteria established by Title 40 Code of Federal Regulations (CFR) Part 261

Table 23 – Soil Sample Results for Waste Categorization COPC (continued)

DU12 **Area 2 - Core PMA** Within the front yard of the Thompson property, adjacent to Aalona Street.	**TCLP Screening Criteria**	**PMAK-DU12-B**
Sample Date		8/4/2011
Sample Depth		0.5-2.0
Soil Analyses (ng/kg)		
TEQ DIOXINS	NE	1800
Soil Analyses (mg/L)		
TCLP TOTAL ARSENIC	5	ND [<0.060]
TCLP BARIUM	100	0.27
TCLP CADMIUM	1	ND [<0.010]
TCLP CHROMIUM	5	ND [<0.025]
TCLP LEAD	5	ND [<0.030]
TCLP SELENIUM	1	ND [<0.10]
TCLP SILVER	5	ND [<0.020]
TCPL MERCURY	0.2	ND [<0.0020]
TCLP ENDRIN	0.02	ND [<0.00020]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [<0.00010]
TCLP HEPTACHLOR	0.008	ND [<0.00010]
TCLP HEPTACHLOR EPOXIDE	NE	ND [<0.00010]
TCLP METHOXYCHLOR	10	ND [<0.0010]
TCLP CHLORDANE	0.03	ND [<0.0010]
TCLP TOXAPHENE	0.5	ND [<0.010]
PH	NE	7.5
FLASHPOINT	NE	>212°F
TA Job No.	HUH0049 and HUL0004	

Table 23 – Soil Sample Results for Waste Categorization COPC (continued)

DU13 **Area 2 - Core PMA** Within the north side yard of the Thompson property, adjacent to Aalona Street	**TCLP Screening Criteria**	**PMAK-DU13-B**
Sample Date		8/3/2011
Sample Depth		0.5-2.0
Soil Analyses (ng/kg)		
TEQ DIOXINS	NE	1400
Soil Analyses (mg/L)		
TCLP TOTAL ARSENIC	5	ND [<0.060]
TCLP BARIUM	100	0.65
TCLP CADMIUM	1	ND [<0.010]
TCLP CHROMIUM	5	ND [<0.025]
TCLP LEAD	5	ND [<0.030]
TCLP SELENIUM	1	ND [<0.10]
TCLP SILVER	5	ND [<0.020]
TCPL MERCURY	0.2	ND [<0.0020]
TCLP ENDRIN	0.02	ND [<0.00020]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [<0.00010]
TCLP HEPTACHLOR	0.008	ND [<0.00010]
TCLP HEPTACHLOR EPOXIDE	NE	ND [<0.00010]
TCLP METHOXYCHLOR	10	ND [<0.0010]
TCLP CHLORDANE	0.03	ND [<0.0010]
TCLP TOXAPHENE	0.5	ND [<0.010]
PH	NE	7.72
FLASHPOINT	NE	>212°F
TA Job No.	HUH0028 and HUL0004	

Table 23 – Soil Sample Results for Waste Categorization COPC (continued)

DU14 **Area 2 - Core PMA** Within the backyard of the Thompson property adjacent to the Foley property.	**TCLP Screening Criteria**	**PMAK-DU14-B**
Sample Date		8/4/2011
Sample Depth		0.5-2.0
Soil Analyses (ng/kg)		
TEQ DIOXINS	NE	35
Soil Analyses (mg/L)		
TCLP TOTAL ARSENIC	5	1.6
TCLP BARIUM	100	0.22
TCLP CADMIUM	1	ND [<0.010]
TCLP CHROMIUM	5	0.074
TCLP LEAD	5	ND [<0.030]
TCLP SELENIUM	1	ND [<0.10]
TCLP SILVER	5	ND [<0.020]
TCPL MERCURY	0.2	ND [<0.0020]
TCLP ENDRIN	0.02	ND [<0.00020]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [<0.00010]
TCLP HEPTACHLOR	0.008	ND [<0.00010]
TCLP HEPTACHLOR EPOXIDE	NE	ND [<0.00010]
TCLP METHOXYCHLOR	10	ND [<0.0010]
TCLP CHLORDANE	0.03	ND [<0.0010]
TCLP TOXAPHENE	0.5	ND [<0.010]
PH	NE	6.91
FLASHPOINT	NE	>212°F
TA Job No.	HUH0049 and HUL0004	

Table 23 – Soil Sample Results for Waste Categorization COPC (continued)

DU15 **Area 2 - Core PMA** Within the south side yard of the Thompson property, adjacent to the Drainage Swale.	**TCLP Screening Criteria**	**PMAK-DU15-B**
Sample Date		8/4/2011
Sample Depth		0.5-2.0
Soil Analyses (ng/kg)		
TEQ DIOXINS	NE	740
Soil Analyses (mg/L)		
TCLP TOTAL ARSENIC	5	0.54
TCLP BARIUM	100	0.3
TCLP CADMIUM	1	ND [<0.010]
TCLP CHROMIUM	5	ND [<0.025]
TCLP LEAD	5	ND [<0.030]
TCLP SELENIUM	1	ND [<0.10]
TCLP SILVER	5	ND [<0.020]
TCPL MERCURY	0.2	ND [<0.0020]
TCLP ENDRIN	0.02	ND [<0.00020]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [<0.00010]
TCLP HEPTACHLOR	0.008	ND [<0.00010]
TCLP HEPTACHLOR EPOXIDE	NE	ND [<0.00010]
TCLP METHOXYCHLOR	10	ND [<0.0010]
TCLP CHLORDANE	0.03	ND [<0.0010]
TCLP TOXAPHENE	0.5	ND [<0.010]
PH	NE	7.3
FLASHPOINT	NE	>212°F
TA Job No.	HUH0049 and HUL0004	

Table 23 – Soil Sample Results for Waste Categorization COPC (continued)

DU16 **Area 2 - Core PMA** Within the driveway of the Foley property, adjacent to the Thompson property.	**TCLP Screening Criteria**	**PMAK-DU16-B**
Sample Date		8/3/2011
Sample Depth		0.5-2.0
Soil Analyses (ng/kg)		
TEQ DIOXINS	NE	260
Soil Analyses (mg/L)		
TCLP TOTAL ARSENIC	5	ND [<0.060]
TCLP BARIUM	100	0.42
TCLP CADMIUM	1	ND [<0.010]
TCLP CHROMIUM	5	ND [<0.025]
TCLP LEAD	5	ND [<0.030]
TCLP SELENIUM	1	ND [<0.10]
TCLP SILVER	5	ND [<0.020]
TCPL MERCURY	0.2	ND [<0.0020]
TCLP ENDRIN	0.02	ND [<0.00020]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [<0.00010]
TCLP HEPTACHLOR	0.008	ND [<0.00010]
TCLP HEPTACHLOR EPOXIDE	NE	ND [<0.00010]
TCLP METHOXYCHLOR	10	ND [<0.0010]
TCLP CHLORDANE	0.03	ND [<0.0010]
TCLP TOXAPHENE	0.5	ND [<0.010]
PH	NE	7.77
FLASHPOINT	NE	>212°F
TA Job No.	HUH0028, HUI0096, and HUL0004	

Table 23 – Soil Sample Results for Waste Categorization COPC (continued)

DU17 **Area 2 - Core PMA** Within the backyard of the Foley property, adjacent to the Drainage Swale.	**TCLP Screening Criteria**	**PMAK-DU17-B**
Sample Date		8/5/2011
Sample Depth		0.5-2.0
Soil Analyses (ng/kg)		
TEQ DIOXINS	NE	400
Soil Analyses (mg/L)		
TCLP TOTAL ARSENIC	5	2.6
TCLP BARIUM	100	0.4
TCLP CADMIUM	1	ND [<0.010]
TCLP CHROMIUM	5	0.46
TCLP LEAD	5	0.064
TCLP SELENIUM	1	ND [<0.10]
TCLP SILVER	5	ND [<0.020]
TCPL MERCURY	0.2	0.028
TCLP ENDRIN	0.02	ND [<0.00020]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [<0.00010]
TCLP HEPTACHLOR	0.008	ND [<0.00010]
TCLP HEPTACHLOR EPOXIDE	NE	ND [<0.00010]
TCLP METHOXYCHLOR	10	ND [<0.0010]
TCLP CHLORDANE	0.03	ND [<0.0010]
TCLP TOXAPHENE	0.5	ND [<0.010]
PH	NE	7.29
FLASHPOINT	NE	>212°F
TA Job No.	HUH0049 and HUL0004	

LEGEND
Red Bold Text = Detected concentration exceeds the TCLP screening criteria.

mg/l = milligrams per liter (parts per million [ppm] equivalent)
ng/kg = nanograms per kilogram (parts per trillion [ppt] equivalent)
NA = Not analyzed
ND = Not detected at or above the limit shown in brackets
NE = Not established
TCLP Screening Criteria established by Title 40 Code of Federal Regulations (CFR) Part 261

8.2.1 DU1

Samples from Layers A to C were analyzed. Layers D and E were not analyzed, based on the results of Layer C. The DU1 samples were analyzed for the primary COPC category. DU1 overlapped with the previous DU/Sample ID: KSPMA-DU5 from the HEER Office December 2010 sampling event.

The Layer A sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. Bioaccessible arsenic was not detected (ND) above the laboratory reporting limit. All remaining primary COPC concentrations were below the applicable Tier I EALs. The previous KSPMA-DU5 Layer A sample had a total arsenic concentration that exceeded the Tier I EAL, but the bioaccessible arsenic concentration was below the Tier I EAL.

The Layer B sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. The bioaccessible arsenic concentration was below the applicable Tier I EAL of 23 mg/kg. Lead was detected at a concentration exceeding the applicable Tier I EAL of 200 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer C primary COPC concentrations were below the applicable Tier I EALs.

8.2.2 DU2

Samples from Layers A to D were analyzed. Layer E was not analyzed, based on the results of Layer D. The DU2 samples were analyzed for the primary COPC category. DU2 overlapped with the previous DU/Sample IDs: KSPMA-DU2 and KSPMA-DU3 from the HEER Office December 2010 sampling event.

All Layer A primary COPC concentrations were below the applicable Tier 1 EALs. The previous KSPMA-DU2 and KSPMA-DU3 Layer A samples both had total arsenic concentrations that exceeded the Tier I EAL, but the bioaccessible arsenic concentrations were below the Tier I EAL.

The Layer B sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. Bioaccessible arsenic was below the applicable Tier I EAL of 23 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer C sample had total arsenic and bioaccessible arsenic concentrations exceeding the applicable Tier I EALs. Lead was detected at concentrations above the applicable Tier I EAL of 200 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer D primary COPC concentrations were below the applicable Tier I EALs.

8.2.3 DU3

Samples from Layers A to C were analyzed. Layers D and E were not analyzed, based on the results of Layer C. The DU3 samples were analyzed for the primary COPC category. DU3 overlapped with the previous DU/Sample IDs: KSPMA-DU1 and KSPMA-DU4 from the HEER Office December 2010 sampling event.

All Layer A primary COPC concentrations were below the applicable Tier I EALs. All Layer A COPC concentrations were below the applicable Tier I EALs in the previous HEER Office samples collected from KSPMA-DU1 and KSPMA-DU4.

The Layer B sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. Bioaccessible arsenic was below the applicable Tier I EAL of 23 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer C primary COPC concentrations were below the applicable Tier 1 EALs.

8.2.4 DU4

Samples from Layers A to D were analyzed. Layer E was not analyzed, based on the results of Layer D. The DU4 samples were analyzed for the primary COPC category. Triplicate samples were collected from DU4. DU4 did not overlap with any previous DU/Sample IDs.

All three Layer A samples had primary COPC concentrations below the applicable Tier 1 EALs.

All three Layer B samples had total arsenic concentrations equal to or exceeding the Tier I EAL of 24 mg/kg. Bioaccessible arsenic concentrations were below the applicable Tier I EAL of 23 mg/kg in two of these samples. One replicate sample (PMAK-DU4-B-T2) had a concentration of bioaccessible arsenic (23.8 mg/kg) that slightly exceeded the Tier I EAL. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All three Layer C samples had lead concentrations exceeding the Tier I EAL of 200 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All three Layer D samples had primary COPC concentrations below the applicable Tier I EALs.

8.2.5 DU5

Samples from Layers B to E were analyzed. Layer A was not analyzed because the HEER Office previously performed surface sampling in this area. The DU5 samples were analyzed for the primary COPC category. DU5 overlapped with the previous DU/Sample IDs: KKSC-DU1 and KKSC-DU2 from the HEER Office August 2010 sampling event.

All Layer A COPC concentrations were below the applicable Tier I EALs in the previous HEER Office samples collected from KKSC-DU1 and KKSC-DU2.

The Layer B sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. The bioaccessible arsenic concentration was ND. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer C sample had concentrations of the following analytes exceeding applicable Tier I EALs: TEQ dioxins, total arsenic, and bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer D sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. This sample was not analyzed for bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer E primary COPC concentrations were below the applicable Tier I EALs.

8.2.6 DU6

Samples from Layers A to C were analyzed. Layers D and E were not analyzed, based on the results of Layer C. The DU6 samples were analyzed for the primary COPC category. Triplicate samples were collected from DU6. DU6 did not overlap with any previous DU/Sample IDs.

All primary COPC concentrations were below the applicable Tier I EALs for the Layers A to C samples.

8.2.7 DU7

Samples from Layers A to C were analyzed. Layers D and E were not analyzed, based on the results of Layer C. The DU7 samples were analyzed for the primary COPC category. DU7 did not overlap with any previous DU/Sample IDs.

All primary COPC concentrations were below the applicable Tier I EALs for the Layers A to C samples.

8.2.8 DU8

Samples from Layers A to C were analyzed. Layers D-E were not analyzed, based on the results of Layer C. The DU8 samples were analyzed for the primary COPC category. DU8 did not overlap with any previous DU/Sample IDs.

The Layer A sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. The bioaccessible arsenic concentration was below the applicable Tier I EAL of 23 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer B primary COPC concentrations were below the applicable Tier I EALs.

The Layer C sample had a lead concentration exceeding the applicable Tier I EAL of 200 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.9 DU9

Samples from Layers A to C were analyzed. Layers D-E were not analyzed, based on the results of Layer C. The DU9 samples were analyzed for the primary COPC category. DU9 did not overlap with any previous DU/Sample IDs.

All Layer A primary COPC concentrations were below the applicable Tier I EALs.

The Layer B sample had a lead concentration exceeding the applicable Tier I EAL of 200 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer C primary COPC concentrations were below the applicable Tier I EALs.

8.2.10 DU10

Samples from Layers A to E were analyzed for the primary COPC, waste categorization COPC, and other COPC categories. DU10 overlapped with the previous DU/Sample IDs: KSPMA-DU6 and KSPMA-DU7 from the HEER Office December 2010 sampling event.

The previous HEER Office samples collected from KSPMA-DU6 and KSPMA-DU7 had concentrations of the following analytes exceeding the applicable Tier I EALs in Layer A: TEQ dioxins, total arsenic, bioaccessible arsenic, and pentachlorophenol.

The Layer A sample from DU10 was not analyzed for the primary COPC or waste categorization COPC, because the HEER Office previously performed surface sampling in this area; however, Layer A was analyzed for other COPCs. All Layer A other COPC concentrations from DU10 were below the applicable Tier I EALs.

The Layer B sample had concentrations of the following analytes exceeding applicable Tier I EALs: TEQ dioxins, total arsenic, bioaccessible arsenic, and lead. Concentrations of all remaining primary COPCs and other COPCs were below the applicable Tier I EALs. The Layer B sample had a TCLP total arsenic concentration (7.3 milligrams per liter [mg/l]) that exceeded the TCLP screening criteria of 5 mg/l. This indicates the soil in DU10 Layer B is categorized as a characteristic hazardous waste and should be managed accordingly.

The Layer C sample had concentrations of the following analytes exceeding applicable Tier I EALs: total arsenic, pentachlorophenol, TPH-DRO, and 1-Methylnaphthalene. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. Concentrations of all remaining primary COPCs and other COPCs were below the applicable Tier I EALs. All Layer C waste categorization COPC were below the applicable TCLP screening criteria.

The Layer D sample had concentrations of the following analytes exceeding applicable Tier I EALs: total arsenic, pentachlorophenol, TPH-DRO, TPH-RRO, and 1-Methylnaphthalene greater than the applicable HEER Office Tier I EALs. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. Concentrations of all remaining primary COPCs and other COPCs were below the applicable Tier I EALs. All Layer D waste categorization COPC were below the applicable TCLP screening criteria. The Layer E sample had concentrations of the following analytes exceeding applicable Tier I EALs: total arsenic, pentachlorophenol, TPH-DRO, TPH-RRO, naphthalene, and 1-Methylnaphthalene. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. Concentrations of all remaining primary COPCs and other COPCs were below the applicable Tier I EALs. The Layer E sample had a TCLP total arsenic concentration (12 mg/l) that exceeded the TCLP screening criteria of 5 mg/l. This indicates the soil in DU10 Layer E is categorized as a characteristic hazardous waste and should be managed accordingly.

8.2.11 DU11

Samples from Layers A to C were analyzed. Layers D-E were not analyzed, based on the results of Layer C. The DU11 samples were analyzed for the primary COPC and other COPC categories. DU11 overlapped with the previous DU/Sample ID: KSPMA-DU8 from the HEER Office December 2010 sampling event.

The previous HEER Office sample collected from KSPMA-DU8 had concentrations of the following analytes exceeding the applicable Tier I EALs in Layer A: total arsenic and bioaccessible arsenic.

The Layer A sample from DU11 was not analyzed for the primary COPC, because the HEER Office previously performed surface sampling in this area; however, Layer A was analyzed for other COPCs. The Layer A sample had a benzo(a)pyrene concentration (2.11 mg/kg) that marginally exceeded the applicable Tier I EAL of 2.1 mg/kg. All remaining other COPC concentrations were below the applicable Tier I EALs.

The Layer B sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. The bioaccessible arsenic concentration was below the applicable Tier I EAL of 95 mg/kg. Concentrations of all remaining primary COPCs and other COPCs were below the applicable Tier I EALs.

All Layer C primary COPC and other COPC concentrations were below the applicable Tier I EALs.

8.2.12 DU12

Samples from Layers B to E were analyzed. Layer A was not analyzed because the HEER Office previously performed surface sampling in this area, because the HEER Office previously performed surface sampling in this area. The DU12 samples were analyzed for the primary COPC and waste categorization COPC categories. DU12 overlapped with the previous DU/Sample IDs: KKSC-DU5 from the HEER Office August 2010 sampling event.

The previous HEER Office sample collected from KKSC-DU5 had concentrations of the following analytes exceeding the applicable Tier I EALs in Layer A: TEQ dioxins, total arsenic, mercury, and lead.

The Layer B sample had concentrations of the following analytes exceeding applicable Tier I EALs: TEQ dioxins, total arsenic, and TPH-RRO. This sample was not analyzed for bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs. All Layer B waste categorization COPC were below the applicable TCLP screening criteria.

The Layer C sample had concentrations of the following analytes exceeding applicable Tier I EALs: total arsenic, lead, TPH-DRO, and TPH-RRO. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer D sample had concentrations of the following analytes exceeding applicable Tier I EALs: total arsenic, lead, TPH-DRO, and TPH-RRO. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer E sample had concentrations of the following analytes which exceeded applicable Tier I EALs: total arsenic, TPH-DRO, and TPH-RRO. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.13 DU13

Samples from Layers A to D were analyzed. Layer E was not analyzed, based on the results of Layer D, and is archived at the laboratory. The DU13 samples were analyzed for the primary COPC and waste categorization COPC categories. DU13 did not overlap with any previous DU/Sample IDs.

The Layer A sample had TEQ dioxins and total arsenic concentrations exceeding the applicable Tier I EALs. This sample was not analyzed for bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer B sample had TEQ dioxins and total arsenic concentrations exceeding the applicable Tier I EALs. This sample was not analyzed for bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs. All Layer B waste categorization COPC were below the applicable TCLP screening criteria. The Layer C sample had total arsenic and lead concentrations exceeding the applicable Tier I EALs. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer D primary COPC concentrations were below applicable Tier 1 EALs.

8.2.14 DU14

Samples from Layers B to D were analyzed. Layer A was not analyzed because the HEER Office previously performed surface sampling in this area. Layer E was not analyzed based upon the results of Layer D. The DU14 samples were analyzed for the primary COPC and waste categorization COPC categories. DU14 overlapped with the previous DU/Sample IDs: KKSC-DU6, KKSC-DU7, and KKSC-DU8 from the HEER Office August 2010 sampling event.

The previous HEER Office samples collected from KKSC-DU6, KKSC-DU7, and KKSC-DU8 had concentrations of the following analytes exceeding the applicable Tier I EALs in Layer A: TEQ dioxins, total arsenic, bioaccessible arsenic, and mercury.

The Layer B sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. This sample was not analyzed for bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs. All Layer B waste categorization COPC were below the applicable TCLP screening criteria.

The Layer C sample had a total arsenic concentration exceeding the Tier I EAL of 24 mg/kg. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer D sample had total arsenic and mercury concentrations exceeding the applicable Tier I EALs. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.15 DU15

Samples from Layers B to D were analyzed. Layer A was not analyzed because the HEER Office previously performed surface sampling in this area. Layer E was not analyzed based upon the results of Layer D. The DU15 samples were analyzed for the primary COPC and waste categorization COPC categories. DU15 overlapped with the previous DU/Sample IDs: KKSC-DU6, KKSC-DU7, and KKSC-DU8 from the HEER Office August 2010 sampling event.

The previous HEER Office samples collected from KKSC-DU6, KKSC-DU7, and KKSC-DU8 had concentrations of the following analytes exceeding the applicable Tier I EALs in Layer A: TEQ dioxins, total arsenic, bioaccessible arsenic, and mercury.

The Layer B sample had concentrations of the following analytes exceeding applicable Tier I EALs: TEQ dioxins, total arsenic, mercury, and lead. This sample was not analyzed for bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs. All Layer B waste categorization COPC were below the applicable TCLP screening criteria. The Layer C sample had total arsenic and lead concentrations exceeding the applicable Tier I EALs. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer D sample had concentrations of the following analytes exceeding applicable Tier I EALs: total arsenic, lead, and pentachlorophenol. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.16 DU16

Samples from Layers A to D were analyzed. Layer E was not analyzed, based on the results of Layer D. The DU16 samples were analyzed for the primary COPC and waste categorization COPC categories. DU16 did not overlap with any previous DU/Sample IDs.

All Layer A primary COPC concentrations were below the applicable Tier I EALs.

The Layer B sample had TEQ dioxins concentrations exceeding the applicable Tier I EAL of 240 ng/kg. The bioaccessible arsenic concentration was below the applicable Tier I EAL of 23 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs. All Layer B waste categorization COPC were below the applicable TCLP screening criteria. The Layer C sample had total arsenic and bioaccessible arsenic concentrations exceeding the applicable Tier I EALs. This sample was not analyzed for TEQ dioxins. All remaining primary COPC concentrations were below the applicable Tier I EALs.

All Layer D primary COPC concentrations were below applicable Tier 1 EALs.

8.2.17 DU17

Samples from Layers B to D were analyzed. Layer A was not analyzed because the HEER Office previously performed surface sampling in this area. Layer E was not analyzed based upon the results of Layer D. The DU17 samples were analyzed for the primary COPC and waste categorization COPC categories. DU17 overlapped with the previous DU/Sample ID: KKSC-DU3 from the HEER Office August 2010 sampling event.

The previous HEER Office sample collected from KKSC-DU3 had concentrations of the following analytes exceeding the applicable Tier I EALs in Layer A: TEQ dioxins and total arsenic.

The Layer B sample had concentrations of the following analytes exceeding applicable Tier I EALs: TEQ dioxins, total arsenic, and mercury. This sample was not analyzed for bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs. All Layer B waste categorization COPC were below the applicable TCLP screening criteria. The Layer C sample had a total arsenic concentration exceeding the Tier I EAL. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

The Layer D sample had a total arsenic concentration which exceeded the Tier I EAL. This sample was not analyzed for TEQ dioxins or bioaccessible arsenic. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.18 DU18

The Layer A sample was analyzed for the primary COPC category. Triplicate samples were collected from DU18. DU18 did not overlap with any previous DU/Sample IDs.

All three Layer A samples had concentrations of total arsenic exceeding the Tier I EAL of 24 mg/kg. However, all bioaccessible arsenic concentrations were ND. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.19 DU19

The Layer A sample was analyzed for the primary COPC category. DU19 did not overlap with any previous DU/Sample IDs.

The Layer A sample had a concentration of total arsenic equal to the Tier I EAL of 24 mg/kg. However, the bioaccessible arsenic concentration was ND. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.20 DU21

The Layer A sample was analyzed for the primary COPC category. DU21 did not overlap with any previous DU/Sample IDs.

The Layer A sample had a concentration of total arsenic exceeding the Tier I EAL of 24 mg/kg. However, the bioaccessible arsenic concentration was below the Tier I EAL of 23 mg/kg. This sample was not analyzed for TEQ dioxins. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.21 DU22

The Layer A sample was analyzed for the primary COPC category. DU22 did not overlap with any previous DU/Sample IDs.

The Layer A sample had a concentration of total arsenic exceeding the Tier I EAL of 24 mg/kg. However, the bioaccessible arsenic concentration was below the Tier I EAL of 23 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.22 DU23

The Layer A sample was analyzed for the primary COPC category. DU23 did not overlap with any previous DU/Sample IDs.

The Layer A sample had a concentration of total arsenic exceeding the Tier I EAL of 24 mg/kg. However, the bioaccessible arsenic concentration was ND. Lead was detected at a concentration which was equal to the applicable Tier I EAL of 200 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.23 DU24

Samples from Layer A were analyzed for the primary COPC category. Triplicate samples were collected from DU24. DU24 did not overlap with any previous DU/Sample IDs.

All three Layer A samples had concentrations of total arsenic exceeding the Tier I EAL of 24 mg/kg. However, the bioaccessible arsenic concentrations were all below the Tier I EAL of 23 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.24 DU25

The Layer A sample was analyzed for the primary COPC category. DU25 did not overlap with any previous DU/Sample IDs.

The Layer A sample had a concentration of total arsenic exceeding the Tier I EAL of 24 mg/kg. However, the bioaccessible arsenic concentration was below the Tier I EAL of 23 mg/kg. All remaining primary COPC concentrations were below the applicable Tier I EALs.

8.2.25 DU26

The sample from the observed debris layer (typically 3-4.5 feet bgs) was analyzed for the full PMA COPC category. DU26 overlapped with the previous DU/Sample IDs: KKSC-DU1 and KKSC-DU2 from the HEER Office August 2010 sampling event, as well as previous DU/Sample ID: KBV-01 from the Kauai Environmental January 2011 sampling event at the HHA property debris pit.

All Layer A COPC concentrations were below the applicable Tier I EALs in the previous HEER Office samples collected from KKSC-DU1 and KKSC-DU2. The previous Kauai Environmental sample collected from KBV-01 had concentrations of the following analytes exceeding the applicable Tier I EALs in the debris layer (4-6 feet bgs): total arsenic, lead, and pentachlorophenol.

The sample from DU26 had concentrations of the following analytes exceeding applicable Tier I EALs: total arsenic, lead, and benzo(a)pyrene. This sample was not analyzed for bioaccessible arsenic. All remaining full PMA COPC concentrations were below the applicable Tier I EALs.

8.2.26 DU27

The sample from the observed debris layer (typically 3-4.5 feet bgs) was analyzed for the full PMA COPC category. DU27 overlapped with the previous DU/Sample ID: KKSC-DU2 from the HEER Office August 2010 sampling event.

All Layer A COPC concentrations were below the applicable Tier I EALs in the previous HEER Office sample collected from KKSC-DU1.

The sample from DU27 had concentrations of the following analytes exceeding applicable Tier I EALs: TEQ dioxins, total arsenic, and lead. This sample was not analyzed for bioaccessible arsenic. All remaining full PMA COPC concentrations were below the applicable Tier I EALs.

8.3 Field Quality Control Sample Results

Field replicate samples (triplicates) were collected from DU4, DU6, DU18, and DU24 to document the representativeness of multi-increment sampling and overall precision of the site investigation's sampling strategy. Field replicates were evaluated for the standard deviation (SD) and relative standard deviation (RSD) for each of the primary COPC. SD and RSD calculations were completed using the appropriate functions in Microsoft Excel and are in Appendix C.

The RSD calculations for DU4 Layers A, B, and D for the primary COPC were within the designated RSD limit of less than 35 percent. The RSD calculation for DU4 Layer C for lead was 37.48 percent, which is slightly greater than the designated RSD limit. This suggests the DU4 Layer C field replicate samples show slightly elevated variance and slightly lower precision.

The RSD calculations for DU6 Layers A-C for the primary COPC were within the designated RSD limit of less than 35 percent.

The RSD calculations for DU18 Layer A, for the primary COPC were within the designated RSD limit of less than 35 percent.

The RSD calculations for DU24 Layer A, for the primary COPC were within the designated RSD limit of less than 35 percent.

Generally, the RSD calculations for the field replicates samples fell within the designated RSD limit. This suggests that, overall, the field replicate samples show low variance and high precision. Tetra Tech is unaware of any additional field sampling methodologies or sample preparatory procedures that could have been implemented that would have yielded higher precision in the field replicate samples.

8.4 IDW Sample Results

The complete laboratory analytical data reports for this site investigation are in Appendix B. This section summarizes the IDW sample results. Three multi-increment IDW samples were collected from the soil cuttings stored in the 5-gallon buckets, prior to transferring the soil cuttings to the 55-gallon drums. These IDW samples were collected and analyzed to determine the disposal options for the IDW drums.

All waste categorization COPC concentrations were below the applicable Tier I EALs (or other regulatory action levels) for all three IDW samples. Table 23 has a summary of the IDW sample results.

Table 24 – IDW Sample Results (3 pages)

Waste Characterization (WC) for IDW Soil Cuttings Area 1, 3, and 4	TCLP Screening Criteria (mg/L)	PMAK-Area 1-WC
Sample Date		8/11/2011
Analytes		
TCLP TOTAL ARSENIC	5	ND [< 0.20]
TCLP BARIUM	100	0.68
TCLP CADMIUM	1	ND [< 0.10]
TCLP CHROMIUM	5	ND [< 0.10]
TCLP LEAD	5	ND [< 0.10]
TCLP SELENIUM	1	ND [< 0.10]
TCLP SILVER	5	ND [< 0.20]
TCPL MERCURY	0.2	ND [< 0.002]
TCLP ENDRIN	0.02	ND [< 0.00050]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [< 0.00050]
TCLP HEPTACHLOR	0.008	ND [< 0.00050]
TCLP HEPTACHLOR EPOXIDE	NE	ND [< 0.00050]
TCLP METHOXYCHLOR	10	ND [< 0.00050]
TCLP CHLORDANE	0.03	ND [< 0.010]
TCLP TOXAPHENE	0.5	ND [< 0.020]
PH	NE	7.14
IGNITABILITY	NE	Not Ignitable
TA Job No.	HUH0072	

LEGEND
mg/L = milligrams per liter (parts per million [ppm] equivalent)
NA = Not analyzed
ND = Not detected at or above the limit shown in brackets
NE = Not established
TCLP Screening Criteria established by Title 40 Code of Federal Regulations (CFR) Part 261

Table 24 – IDW Sample Results (continued)

Waste Characterization (WC) for IDW Soil Cuttings Area 2	TCLP Screening Criteria (mg/L)	PMAK-Area 2-WC
Sample Date		8/11/2011
Analytes		
TCLP TOTAL ARSENIC	5	0.22
TCLP BARIUM	100	0.8
TCLP CADMIUM	1	ND [< 0.10]
TCLP CHROMIUM	5	ND [< 0.10]
TCLP LEAD	5	ND [< 0.10]
TCLP SELENIUM	1	ND [< 0.10]
TCLP SILVER	5	ND [< 0.20]
TCPL MERCURY	0.2	ND [< 0.002]
TCLP ENDRIN	0.02	ND [< 0.00050]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [< 0.00050]
TCLP HEPTACHLOR	0.008	ND [< 0.00050]
TCLP HEPTACHLOR EPOXIDE	NE	ND [< 0.00050]
TCLP METHOXYCHLOR	10	ND [< 0.00050]
TCLP CHLORDANE	0.03	ND [< 0.010]
TCLP TOXAPHENE	0.5	ND [< 0.020]
PH	NE	7.47
IGNITABILITY	NE	Not Ignitable
TA Job No.	HUH0072	

LEGEND
mg/L = milligrams per liter (parts per million [ppm] equivalent)
NA = Not analyzed
ND = Not detected at or above the limit shown in brackets
NE = Not established
TCLP Screening Criteria established by Title 40 Code of Federal Regulations (CFR) Part 261

Table 24 – IDW Sample Results (continued)

Waste Characterization (WC) for IDW Soil Cuttings Area 5	TCLP Screening Criteria (mg/L)	PMAK-Area 5-WC
Sample Date		8/11/2011
Analytes		
TCLP TOTAL ARSENIC	5	ND [< 0.20]
TCLP BARIUM	100	0.8
TCLP CADMIUM	1	ND [< 0.10]
TCLP CHROMIUM	5	ND [< 0.10]
TCLP LEAD	5	ND [< 0.10]
TCLP SELENIUM	1	ND [< 0.10]
TCLP SILVER	5	ND [< 0.20]
TCPL MERCURY	0.2	ND [< 0.002]
TCLP ENDRIN	0.02	ND [< 0.00050]
TCLP GAMMA-BHC (LINDANE)	0.4	ND [< 0.00050]
TCLP HEPTACHLOR	0.008	ND [< 0.00050]
TCLP HEPTACHLOR EPOXIDE	NE	ND [< 0.00050]
TCLP METHOXYCHLOR	10	ND [< 0.00050]
TCLP CHLORDANE	0.03	ND [< 0.010]
TCLP TOXAPHENE	0.5	ND [< 0.020]
PH	NE	7.4
IGNITABILITY	NE	Not Ignitable
TA Job No.	HUH0072	

LEGEND

mg/L = milligrams per liter (parts per million [ppm] equivalent)

NA = Not analyzed

ND = Not detected at or above the limit shown in brackets

NE = Not established

TCLP Screening Criteria established by Title 40 Code of Federal Regulations (CFR) Part 261

8.5 Data Verification and Validation

All sample analytical results were evaluated in accordance with precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. The subsections below detail the results relating to each of the PARCC parameters. A data validation report was prepared for each of the six sample delivery groups (SDG). Copies of the data validation reports are in Appendix D.

8.5.1 Precision

Laboratory precision was evaluated through the matrix spike/matrix spike duplicate (MS/MSD), laboratory control samples (LCS), and laboratory duplicate samples. Generally, the relative percent difference (RPD) of the MS/MSD, LCS, and laboratory duplicate data that were analyzed fell within acceptable limits. Data that was not within the limits were qualified with flags. The specific RPD values for the MS/MSD, LCS, and laboratory duplicate samples are in the laboratory analytical reports in Appendix B.

8.5.2 Accuracy

Laboratory accuracy was evaluated through the MS/MSD, LCS, and laboratory duplicate samples. Generally, the spike recovery (percent recovery) of the MS/MSD, LCS, and laboratory duplicate data that were analyzed fell within acceptable limits. Data that did not fall within the limits were qualified with flags. The specific spike recovery values for the MS/MSD, LCS, and laboratory duplicate samples are in the laboratory analytical reports in Appendix B.

8.5.3 Representativeness

The representativeness was evaluated through the RSD calculations for the field replicate samples (see Section 8.3). Generally, the RSD calculations for the field replicates samples fell within the designated RSD limit. This suggests that, overall, the field replicate samples show low variance and high precision. The data generated from the site investigation is generally assumed to be representative of the media sampled.

8.5.4 Comparability

Comparability of data was achieved by consistently following procedures for sampling and field activities, by using the same type of sampling equipment at each area, and by using the standard measurement units in reporting analytical data. Laboratory data were reported in consistent units for each analytical test. Based on all of these factors, the data generated is assumed comparable.

8.5.5 Completeness

Only soil samples were collected for this site investigation. All field sampling methodologies followed accepted industry standards. All samples were received by the laboratory within the recommended temperature requirements and generally within the recommended holding time requirements.

The recommended holding time was exceeded for the following: some SVOC, mercury, TPH-DRO, and TPH-RRO analyses in sample batch SDG HUH0049; some mercury analyses in sample batch SDG HUH0072; and, some SVOC, organochlorine pesticides, TEQ dioxins, and mercury analyses in sample batch SDG HUL0004. Refer to Appendix D for further details regarding the holding time exceedences. Both the laboratory and Tetra Tech qualified the affected samples with H flags, indicating the samples were analyzed outside the holding time. This data should be considered estimated, but is still acceptable for this investigation.

The data verification process qualified some of the data with flags, but no data was rejected. Therefore, all of the data generated during the site investigation was used.

Completeness was 100 percent.

8.6 Examination of Data Quality Objectives

The DQOs were prepared during the project planning process, and were evaluated throughout the project. Overall, the DQOs for this project were met. Noted differences were discussed in Sections 7.7 and 8.3.

9 Updated Environmental Hazard Evaluation

An EHE is an integral part of the long-term management of impacted soil, groundwater, and soil gas at contaminated properties. This updated EHE was prepared to document and assess the potential environmental hazards associated with the impacted soil at the site under the current site conditions.

9.1 Technical Approach

This updated EHE incorporates the analytical results from the previous sampling by the HEER Office from 2010-2011 and the current site investigation. The analytical results for each sample were compared to the appropriate EALs and Tier I EALs.

The HEER Office developed action levels for specific, potential environmental hazards for three matrices (soil, groundwater, and soil gas). These are referred to as the EALs. The lowest of these specific EALs represents the concentration of the contaminant in the respective media where the threat to human health or the environment is considered insignificant under any site condition. This specific action level is typically designated as the Tier I EAL for that contaminant (HEER Office 2011a and 2011b). This updated EHE uses both the EALs and the Tier I EALs. Table 24 shows the different action levels for mercury used in this EHE as an example.

Table 25 – Example Action Levels Used for Updated EHE

COPC	Matrix	Name of Action Level	Unrestricted Use Value[2] (mg/kg)	Commercial/Industrial Use Value[2] (mg/kg)
Mercury	Soil	Direct Exposure EAL	4.7	61
		Vapor Intrusion EAL	NE	NE
		Terrestrial Ecology EAL	10	10
		Gross Contamination EAL	500	1,000
		Leaching EAL	NE	NE
		Tier I EAL[1]	**4.7**	**61**

NOTES:
NE = Not established
1 = The lowest specific EAL is typically designated as the Tier I EAL.
2 = Fall 2011 Revised Tier I EALs.

The appropriate EALs and Tier I EALs were selected based on the following characteristics:

- Individual property use (i.e., unrestricted or commercial or industrial)
- Groundwater utility with respect to the UIC line, the state aquifer identification and classification (i.e., drinking water or non-drinking water)
- Distance to nearest surface water body (i.e., closer than 150 meters or farther than 150 meters)

Tetra Tech used the EAL Surfer spreadsheet to conduct the updated EHE (HEER Office 2011b). The EAL Surfer reports are in Appendix E.

9.2 Soil Hazards

Tetra Tech evaluated the following soil hazards as part of the updated EHE:

- Direct exposure
- Vapor intrusion
- Terrestrial ecology through runoff
- Gross contamination
- Leaching

Direct exposure, vapor intrusion, terrestrial ecology through runoff, gross contamination, and leaching soil hazards were identified at the site. A brief summary of these soil hazards is in Table 25.

Table 26 – Updated EHE Soil Hazards

Soil Hazard	TEQ Dioxins	Arsenic	Mercury	Pentachlorophenol	Lead	TPH-DRO	TPH-RRO	1-Methylnaphthalene[3]	Naphthalene[3]	Benzo(a)pyrene
(Count[1])										
Direct Exposure	9	23	4	2	6	2	2	0	0	2
Vapor Intrusion	NE	NE	NE	NE	NE	NE	NE	1	1	NE
Terrestrial Ecology[2]	NE	20	4	1	7	NE	NE	NE	0	0
Gross Contamination	4	3	0	0	4	2	2	0	0	0
Leaching	9	NE	NE	1	NE	1	2	0	0	0

NOTES:

NE = Not established

1 = Count refers to the total number of samples that exceeded the EALs for the specific COPC for the designated soil hazard. This count incorporates the analytical results from the current site investigation only. The preliminary EHE in the SAP evaluated the soil hazards for the analytical results from the previous investigations conducted by the HEER Office (August 2010, December 2010, and March 2011).

2 = See Section 9.5 for further details.

3 = See Section 9.4 for further details.

9.3 Groundwater Hazards

No groundwater data is available for the site, as a result, this updated EHE does not include a quantitative evaluation for groundwater contamination. Based on available soil sample analytical results, site conditions, and leaching potential of the identified COPC, there are potential groundwater hazards related to TEQ dioxins, pentachlorophenol, TPH-DRO, and TPH-RRO. The potential groundwater hazards are not considered significant, based on:

- The general depth to potable groundwater in the site region is approximately 200-250 feet bgs.
- The HDOH SDWB confirmed that the site was located on the seaward side of the UIC line, thereby indicating that the groundwater underlying the site is considered non-potable and saline.

9.4 Soil Vapor Hazards

No soil vapor data is available for the site, as a result, this updated EHE does not include a quantitative evaluation for soil vapor contamination. Based on available soil sample analytical results, site conditions, and identified COPC characteristics, there are potential soil vapor hazards at the site related to 1-methylnaphthalene and naphthalene.

The potential soil vapor hazards are not considered significant because the 1-methylnaphthalene- and naphthalene-impacted soil at the site is in DU10, deeper than 2 feet bgs (Layers C to E), and there are currently no human-occupied structures in DU10.

9.5 Potential Receptors

Potentially exposed receptors consist of human receptors and terrestrial ecological receptors. Human receptors include on-site residents, tenants, and visitors; and off-site residents, tenants, and visitors at adjacent properties. Human receptors also include future workers exposed to soils during possible construction or utility repairs at the site properties.

The site does not contain significant, terrestrial ecological habitats, and no sensitive terrestrial ecological receptors are anticipated. This is supported by the following findings:

- According to the 1996 USGS topographic map and EDR report, there are no sensitive ecological receptors or wetlands at or near the site. The nearest surface water body is Kilauea Stream, approximately 0.3 mile west of the site. The Pacific Ocean is approximately 1 mile north of the site (EDR 2011).
- According to the County of Kauai Department of Planning website, the site is zoned for residential or commercial use (depending on the specific property). The site is not in a special management area or wildlife preserve district (KDP 2011).

However, the analytical data from DU18 and DU19 was screened against the applicable terrestrial ecology EALs, due to the potential for ecological impacts at Secret Beach .

9.6 Exposure Pathways

Potential exposure pathways to the impacted soil at the site may include:

- Dermal absorption (through direct contact) of impacted soil by humans
- Inhalation of impacted soil particulates by humans
- Incidental ingestion of impacted soil by humans
- Surface water runoff with impacted soil or sediments for ecological receptors (not a concern for human receptors; also, as indicated in Section 9.5, DU18 and DU19 were the only DUs where data was screened against terrestrial ecology EALs based on the downstream presence of Secret Beach)

9.7 Summary of Conceptual Site Models

The conceptual site models for each identified COPC with exceedances are summarized in Tables 27-36. The purpose of a conceptual site model is to depict a comprehensive representation of a site's environmental conditions with respect to recognized or potential environmental hazards. A conceptual site model is continually updated as the site investigation proceeds and site conditions are better understood (i.e., as more data becomes available) (HEER Office 2011c).

The conceptual site models developed as part of this updated EHE include a summary of primary and secondary sources of contamination, primary release mechanisms, potential environmental hazards, and identification of which hazards are present under current site conditions.

9.7.1 Soil Accessibility

The HEER Office requested that the conceptual site models for updated EHE categorize the impacted soil into two categories:

- Readily accessible soil: soil 0-2 feet bgs (Layers A and B). This soil is considered an exposure pathway under the current site conditions.
- Deeper soil: soil 2-10 feet bgs (Layers C to E). This soil is not considered a potential exposure pathway under the current site conditions.

9.7.2 TEQ Dioxins

Based on the conceptual site model (refer to Table 27), direct exposure to TEQ dioxins and leaching are identified environmental hazards for the Old Mill LLC property (DU10 and DU11), Thompson property (DU12 to DU16), Foley property (DU17) and the debris pit along the western border of the HHA property (DU27). Gross contamination is identified as an environmental hazard for the Thompson property (DU12 through DU15). Because the TEQ dioxins-impacted soil is at the surface (0-2 feet bgs), and is considered readily accessible soil, all three potential human exposure pathways may be present. Leaching is not considered a significant soil hazard because of the depth to groundwater and underlying aquifer use.

9.7.3 Arsenic (Total Arsenic and Bioaccessible Arsenic)

Due to the significant binding capacity of the iron-rich volcanic soils in Hawaii, total arsenic is typically bound to the soil particles and does not readily leach. Based on these findings, the HEER Office uses bioaccessible arsenic data to evaluate potential human health risks for the conceptual site model (HEER Office 2011a and 2011f).

The HEER Office requested that the conceptual site models for updated EHE use the total arsenic and bioaccessible arsenic data (refer to Table 28), because not all samples were analyzed for bioaccessible arsenic. The HEER Office requested that when both total arsenic and bioaccessible arsenic data were available for a given sample, the bioaccessible arsenic data should be used for the conceptual site model because bioaccessible arsenic data more accurately evaluates risks to human health. Bioaccessible arsenic is the fraction of the total arsenic in ingested soil that could be available for absorption by the digestive tract and pose health risks. Equivalent concentrations of bioaccessible arsenic in soil are calculated by multiplying the reported total concentration of arsenic by the fraction that is determined to be bioaccessible by site-specific bioaccessibility tests (HEER Office 2011a and 2011f).

Based on the conceptual site model, direct exposure to arsenic (including total arsenic and bioaccessible arsenic) is an identified environmental hazard in 23 of the 26 DUs. This includes all of the DUs in Areas 2-5 and the majority of Area 1, with the exception of DU6, DU7 and DU9. Gross contamination is also an identified environmental hazard for the Old Mill LLC property and Thompson property. Because the arsenic-impacted soil is at the surface (0-2 feet bgs) and is considered readily accessible soil, all three potential exposure pathways may be present.

In addition, the HEER Office conducted calculations in order to determine the percent bioaccessible arsenic in each sample. These calculations are provided in Appendix I for reference.

9.7.4 Mercury

Based on the conceptual site model (refer to Table 29), direct exposure to mercury is an identified environmental hazard for the Thompson property (DU14 and DU15) and Foley property (DU17). Because the mercury-impacted soil is at the surface (0-2 feet bgs) in DU15 and DU17, and is considered readily accessible soil, all three potential exposure pathways may be present. The mercury-impacted soil in DU14 is located in Layer D (4-7 feet bgs), and is considered deeper soil. There may be exposure through all three exposure pathways if the mercury-impacted soil deeper than 4 feet bgs is exposed. This could occur, for example, from intrusive construction activities such as excavation or trenching.

9.7.5 Pentachlorophenol

Based on the conceptual site model (refer to Table 30), direct exposure and leaching of pentachlorophenol are identified environmental hazards for the Old Mill LLC property (DU10) and the south-side yard of the Thompson property (DU15). The pentachlorophenol-impacted soil is deeper than 2 feet bgs, and is considered deeper soil. There may be exposure through all three exposure pathways if the pentachlorophenol-impacted soil deeper than 2 feet bgs is exposed. This could occur, for example, from intrusive construction activities such as excavation or trenching. Leaching is not considered a significant soil hazard because of the depth to groundwater and underlying aquifer use.

9.7.6 Lead

Based on the conceptual site model (refer to Table 31), direct exposure to lead is an identified environmental hazard at multiple locations at the site. This included the following: along the eastern border of the North Shore Health Center property (DU1); the eastern borders of the Grace Paul Trust, Clarion, and Howard properties (DU2); the southern border of the Ortal property (DU4); the Thompson property (DU12 and DU15); and the debris pit along the western border of the HHA property (DU27). Gross contamination is also an identified environmental hazard for all the same areas except for the North Shore Health Center property.

The lead-impacted soil is at the surface and near-surface (0.5 to 4 feet bgs) and is considered both readily accessible soil and deeper soil, depending on the specific DU. Based on these findings, all three potential exposure pathways may be present.

Based on the HEER Office's assessments at other agricultural sites, lead was not historically used as a pesticide or herbicide in Hawaii, so the HEER Office considers any identified lead-impacted soil to be beyond the scope of this investigation.

9.7.7 TPH-DRO

Based on the conceptual site model (refer to Table 32), direct exposure and gross contamination to TPH-DRO are identified environmental hazards for the Old Mill LLC property (DU10) and the Thompson property (DU12). The TPH-DRO-impacted soil is deeper than 2 feet bgs and is considered deeper soil. Exposure through all three exposure pathways may be present if the TPH-DRO-impacted soil is exposed. This could occur, for example, from intrusive construction activities such as excavation or trenching. Leaching is not considered a significant soil hazard because of the depth to groundwater and underlying aquifer use.

9.7.8 TPH-RRO

Based on the conceptual site model (refer to Table 33), direct exposure, gross contamination and leaching are identified environmental hazards related to TPH-RRO at the Old Mill LLC (DU10) and the Thompson property (DU12). The TPH-RRO-impacted soil is 0.5-10 feet bgs and is considered both readily accessible soil and deeper soil, depending on the specific DU. DU12 Layer B is the only DU with TPH-RRO-impacted soil in the readily accessible soil category. The TPH-RRO-impacted soil in DU12 Layer B is co-located with TEQ dioxins-impacted soil. Because the TPH-RRO-impacted soil is 0.5-10 feet bgs and is considered to be in all three soil accessibility categories, all three potential exposure pathways may be present. Leaching is not considered a significant soil hazard because of the depth to groundwater and underlying aquifer use.

9.7.9 1-Methylnaphthalene

Based on the conceptual site model (refer to Table 34), vapor intrusion is identified as an environmental hazard for 1-methylnaphthalene at the Old Mill LLC property (DU10). The 1-methylnaphthalene-impacted soil is located below 2 feet bgs and is considered deeper soil. Exposure through all three exposure pathways may be present if the 1-methylnaphthalene-impacted soil is exposed. This could occur, for example, from intrusive construction activities such as excavation or trenching. Vapor intrusion hazards are not considered significant because there are currently no human-occupied structures in DU10 and thus no potential receptors.

9.7.10 Naphthalene

Based on the conceptual site model (refer to Table 35), vapor intrusion is identified as an environmental hazard for naphthalene at the Old Mill LLC property (DU10). The naphthalene-impacted soil is located below 2 feet bgs and is considered deeper soil. Exposure through all three exposure pathways may be present if the naphthalene-impacted soil is exposed. This could occur, for example, from intrusive construction activities such as excavation or trenching. Vapor intrusion hazards are not considered significant because there are currently no human-occupied structures in DU10, and thus no potential receptors.

9.7.11 Benzo(a)pyrene

Based on the conceptual site model (refer to Table 36), direct exposure to benzo(a)pyrene is identified as an environmental hazard for the Old Mill LLC property (DU11) and the HHA Debris Pit along the western border of the HHA property (DU26). The benzo(a)pyrene-impacted soil is at the surface and near-surface (0.5 to 4 feet bgs), and is considered both readily accessible soil and deeper soil, depending on the specific DU. Based on these findings, all three potential exposure pathways may be present.

Table 27 – Conceptual Site Model for TEQ Dioxins

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU10, DU11, DU12, DU13, DU15, DU16, DU17, and DU27
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	NE	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	Yes	DU12, DU13, DU-14, and DU15
			Leaching[5]	No[5a]	Leaching is not considered a significant soil hazard because of the depth to groundwater and underlying aquifer use

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
5a = Although EAL surfer identified Leaching as a hazard under current conditions (DU10 through DU17, and DU27), Leaching is not considered a significant soil hazard because of the depth to groundwater and underlying aquifer use. Refer to Section 9.3 for additional details.
6 = See Section 9.5 for further details.

Table 28 – Conceptual Site Model for Arsenic

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU1, DU2, DU3, DU4, DU5, DU8, DU10, DU11, DU12, DU13, DU14, DU15, DU16, DU17, DU18, DU19, DU21, DU22, DU23, DU24, DU25, DU26, and DU27
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	No	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	Yes	DU10, DU14 and DU15
			Leaching[5]	NE	

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.

Table 29 – Conceptual Site Model for Mercury

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU14[7], DU15, and DU17
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	No	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	No	
			Leaching[5]	NE	

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.
7 = See Section 9.7.4 for further details.

Table 30 – Conceptual Site Model for Pentachlorophenol

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU10 and DU15
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	No	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	No	
			Leaching[5]	Yes	DU10

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.

Table 31 – Conceptual Site Model for Lead

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU1, DU2, DU4, DU12, DU15 and DU27
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	No	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	Yes	DU2, DU4, DU15 and DU27
			Leaching[5]	NE	

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.

Table 32 – Conceptual Site Model for TPH-DRO

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU10 and DU12
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	NE	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	Yes	DU10 and DU12
			Leaching[5]	Yes	DU10

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.

Table 33 – Conceptual Site Model for TPH-RRO

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU12
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	NE	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	Yes	DU10 and DU12
			Leaching[5]	Yes	DU10 and DU12

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.

Table 34 – Conceptual Site Model for 1-Methylnapthalene

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	No	
			Vapor Intrusion	No	No significant soil vapor intrusion hazards based on site conditions.[7]
			Risk to Terrestrial Ecological Habitats[3]	NE	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	No	
			Leaching[5]	No	

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.
7 = See Section 9.4 for further details.

Table 35 – Conceptual Site Model for Naphthalene

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	No	
			Vapor Intrusion	Yes	No significant soil vapor intrusion hazards based on site conditions.[7]
			Risk to Terrestrial Ecological Habitats[3]	No	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	No	
			Leaching[5]	No	

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.
7 = See Section 9.4 for further details.

Table 36 – Conceptual Site Model for Benzo(a)pyrene

Primary Sources	Primary Release Mechanisms	Secondary Sources	Potential Environmental Hazards[1]	Hazard Present Under Current Conditions?	Comments
Historic On-Site Use/Storage/Mixing/ Loading/Transporting/ Disposal of Herbicides, Pesticides, and Other Hazardous Materials	Spills/Leaks/ Improper Disposal	Soil	Risk to Human Health – Direct Exposure[2]	Yes	DU11 and DU26
			Vapor Intrusion	NE	
			Risk to Terrestrial Ecological Habitats[3]	No	No significant terrestrial ecological habitats at the site.[6]
			Gross Contamination[4]	No	
			Leaching[5]	No	

NOTES:
NE = Not established
1 = Fall 2011 Revised EALs and Tier I EALs.
2 = Assumes humans have direct exposure to impacted soil and dust.
3 = Assumes a significant terrestrial ecological habitat is adversely affected by the impacted soil with resulting toxicity to flora and fauna.
4 = Gross contamination soil hazards include potential explosive reactions, odors and general nuisance concerns, and general resource degradation.
5 = Assumes potential leaching of contaminants from impacted soil and adverse effects to underlying groundwater.
6 = See Section 9.5 for further details.

9.8 Evaluation of Targeted Contaminants of Concern for Site Investigation

After preparing the updated EHE, the findings and analytical data from the site investigation were further evaluated. TEQ dioxins and arsenic (including total arsenic and bioaccessible arsenic) were again selected as the TCOC, because they were the primary drivers for potential human health risks, and because they were the two most prevalent COPC at the site. The same principals and methods previously presented in Section 3.7, related to bioaccessible arsenic, apply to the following discussion regarding the findings of the subject site investigation.

A focused evaluation of the TCOC detected during the August 2010 investigation was conducted to identify the degree of impact for the TCOC in each DU from this site investigation (as well as the previous overlapping DOH DU/Sample IDs for the 0-0.5 foot bgs interval), with respect to the applicable HEER Office Tier II EAL Risk Categories. The evaluation consisted of three separate steps which are listed below:

- Step 1 – Identify Tier II EAL risk categories (Categories A through D) for each sample for each TCOC (i.e., separate values for TEQ dioxins and arsenic)
- Step 2 – Identify highest impact Tier II EAL risk category for each sample for both TCOC
- Step 3 – Extrapolate Tier II EAL risk categories for areas where no TCOC analytical data is available

The findings from each step of the evaluation are summarized below.

9.8.1 Step 1 – Identify Tier II EAL Risk Categories for Each Sample for Each TCOC

As part of Step 1, the TCOC analytical results were compared to the Tier II EALs for soils on unrestricted use and commercial or industrial use sites (depending on current property use) (HEER Office 2011d and 2011e). In general, each sample had a two separate risk categories, one for TEQ dioxins and one for arsenic. If there was no TCOC analytical data available, the sample was not assigned a risk category. The findings from Step 1 are presented in Appendix H, which includes separate tables for TEQ Dioxins and arsenic.

9.8.2 Step 2 – Identify Highest Impact Tier II EAL Risk Categories for Each Sample

As part of Step 2, the information from Step 1 was used to identify the highest impact Tier II EAL risk category for each sample. The individual risk categories for TEQ dioxins and arsenic for a given sample were compared, and the highest impact risk category identified was assigned to that sample, to provide the most conservative approach. The findings from Step 2 are presented in Table 37, below.

Table 37 – Highest Impact Tier II EAL Risk Categories for Each Sample (6 pages)

DU1 **Area 1 - Perimeter of Core PMA** Along the eastern border of the North Shore Health Center Property	KSPMA-DU5	PMAK-DU1-A	PMAK-DU1-B	PMAK-DU1-C	PMAK-DU1-D	PMAK-DU1-E
Sample Date	12.16.10	8.1.11	8.1.11	8.1.11	8.1.11	8.1.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	B	X	X	X

DU2 **Area 1 - Perimeter of Core PMA** Along the eastern borders of the Grace Paul Trust property, Clarion property and Howard property; adjacent to Aalona St.	KSPMA-DU2	KSPMA-DU3	PMAK-DU2-A	PMAK-DU2-B	PMAK-DU2-C	PMAK-DU2-D	PMAK-DU2-E
Sample Date	12.15.10	12.15.10	8.1.11	8.1.11	8.1.11	8.1.11	8.1.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	B	B	C	A	X

DU3 **Area 1 - Perimeter of Core PMA** Along the eastern borders of the Johnson property, Deforge property, and the southern borders of the Cooper property, Cudiamat property, and Owens property; adjacent to the cul-de-sac portion of Aalona St.	KSPMA-DU1	KSPMA-DU4	PMAK-DU3-A	PMAK-DU3-B	PMAK-DU3-C	PMAK-DU3-D	PMAK-DU3-E
Sample Date	12.15.10	12.15.10	8.2.11	8.2.11	8.2.11	8.2.11	8.2.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	B	B	X	X	X

DU4[2] **Area 1 - Perimeter of Core PMA** Along the southern border of the Ortal property, adjacent to the Foley property.	PMAK-DU4-A-P	PMAK-DU4-A-T1	PMAK-DU4-A-T2	PMAK-DU4-B-P	PMAK-DU4-B-T1	PMAK-DU4-B-T2	PMAK-DU4-C-P	PMAK-DU4-C-T1	PMAK-DU4-C-T2	PMAK-DU4-D-P	PMAK-DU4-D-T1	PMAK-DU4-D-T2	PMAK-DU4-E-P	PMAK-DU4-E-T1	PMAK-DU4-E-T2
Sample Date	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0.5-2.0	0.5-2.0	0.5-2.0	2.0-4.0	2.0-4.0	2.0-4.0	4.0-7.0	4.0-7.0	4.0-7.0	7.0-10.0	7.0-10.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	B	B	B	C	A	A	A	A	A	A	X	X	X

DU5 **Area 1 - Perimeter of Core PMA** Along the western borders of the Ortal property and Foley property. This DU is adjacent to the HHA property.	KKSC-DU1	KKSC-DU2	PMAK-DU5-A	PMAK-DU5-B	PMAK-DU5-C	PMAK-DU5-D	PMAK-DU5-E
Sample Date	8.19.10	8.19.10	8.10.11	8.10.11	8.10.11	8.10.11	8.10.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	A	B	X	B	C	C[3]	A

LEGEND

TCOC = Targeted contaminant of concern (TEQ dioxins or arsenic)
X = No TCOC analytical data available (i.e., sample listed as NA [Not Analyzed] or H [Hold]) on Table 22
[1] = The individual risk categories for TEQ dioxins and arsenic for each sample were compared, and the highest risk category identified was assigned to that sample. This approach was selected to present the most conservative scenario.
[2] = Triplicate Sample
[3]= Tier II EAL Risk Category estimated using 10% of total arsenic concentration to infer the bioaccessible arsenic concentration.

Shading=	Sample collected during current site investigation
Shading=	Sample collected during previous sampling activities (HEER Office or Kauai Environmental)

Fall 2011 Revised Tier I EALs and July2010/Fall 2011 Revised Tier II EALs

Table 37 – Highest Impact Tier II EAL Risk Categories for Each Sample (continued)

DU6[2] **Area 1 - Perimeter of Core PMA** Along the southern boundary of the HHA property, adjacent to Natural Bridges School property.	PMAK-DU6-A-P	PMAK-DU6-A-T1	PMAK-DU6-A-T2	PMAK-DU6-B-P	PMAK-DU6-B-T1	PMAK-DU6-B-T2	PMAK-DU6-C-P	PMAK-DU6-C-T1	PMAK-DU6-C-T2	PMAK-DU6-D-P	PMAK-DU6-D-T1	PMAK-DU6-D-T2	PMAK-DU6-E-P	PMAK-DU6-E-T1	PMAK-DU6-E-T2
Sample Date	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0.5-2.0	0.5-2.0	0.5-2.0	2.0-4.0	2.0-4.0	2.0-4.0	4.0-7.0	4.0-7.0	4.0-7.0	7.0-10.0	7.0-10.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	B	A	A	A	A	A	A	X	X	X	X	X	X

DU7 **Area 1 - Perimeter of Core PMA** Along the southern boundary of the HHA property, adjacent to Natural Bridges School property.	PMAK-DU7-A	PMAK-DU7-B	PMAK-DU7-C	PMAK-DU7-D	PMAK-DU7-E
Sample Date	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	A	X	X

DU8 **Area 1 - Perimeter of Core PMA** Along the eastern border of the Old Mill LLC property, adjacent to the Natural Bridges School property.	PMAK-DU8-A	PMAK-DU8-B	PMAK-DU8-C	PMAK-DU8-D	PMAK-DU8-E
Sample Date	8.2.11	8.2.11	8.2.11	8.2.11	8.2.11
Depth Intervals (' bgs)	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	A	X	X

DU9 **Area 1 - Perimeter of Core PMA** Along the southern border of the Old Mill LLC property, adjacent to Oka Street.	PMAK-DU9-A	PMAK-DU9-B	PMAK-DU9-C	PMAK-DU9-D	PMAK-DU9-E
Sample Date	8.2.11	8.2.11	8.2.11	8.2.11	8.2.11
Depth Intervals (' bgs)	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	B	A	X	X

DU10 **Area 2 - Core PMA** Within the western portion of the Drainage Swale, which is along the northern border of the Old Mill LLC property.	KSPMA-DU6	KSPMA-DU7	PMAK-DU10-A	PMAK-DU10-B	PMAK-DU10-C	PMAK-DU10-D	PMAK-DU10-E
Sample Date	12.15.10	12.16.10	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	D	D	X	D	D[3]	D[3]	D[3]

Table 37 – Highest Impact Tier II EAL Risk Categories for Each Sample (continued)

DU11 **Area 2 - Core PMA** Within the eastern portion of the Drainage Swale. Along the northern border of the Old Mill LLC property.	KSPMA-DU8	PMAK-DU11-A	PMAK-DU11-B	PMAK-DU11-C	PMAK-DU11-D	PMAK-DU11-E
Sample Date	12.16.10	8.8.11	8.8.11	8.8.11	8.8.11	8.8.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	C	X	C	A	X	X

DU12 **Area 2 - Core PMA** Within the front yard of the Thompson property, adjacent to Aalona Street.	KKSC-DU5	PMAK-DU12-A	PMAK-DU12-B	PMAK-DU12-C	PMAK-DU12-D	PMAK-DU12-E
Sample Date	8.18.10	8.4.11	8.4.11	8.4.11	8.4.11	8.4.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	C	X	D	C[3]	C[3]	B

DU13 **Area 2 - Core PMA** Within the north side yard of the Thompson property, adjacent to Aalona Street	PMAK-DU13-A	PMAK-DU13-B	PMAK-DU13-C	PMAK-DU13-D	PMAK-DU13-E
Sample Date	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11
Depth Intervals (' bgs)	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	C	C	B	A	X

DU14 **Area 2 - Core PMA** Within the backyard of the Thompson property adjacent to the Foley property.	KKSC-DU6[3]	KKSC-DU7[3]	KKSC-DU8[3]	PMAK-DU14-A	PMAK-DU14-B	PMAK-DU14-C	PMAK-DU14-D	PMAK-DU14-E
Sample Date	8.18.10	8.18.10	8.18.10	8.4.11	8.4.11	8.4.11	8.4.11	8.4.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	C	D	C	B	D[3]	D[3]	B	X

DU15 **Area 2 - Core PMA** Within the south side yard of the Thompson property, adjacent to the Drainage Swale.	KKSC-DU6[3]	KKSC-DU7[3]	KKSC-DU8[3]	PMAK-DU15-A	PMAK-DU15-B	PMAK-DU15-C	PMAK-DU15-D	PMAK-DU15-E
Sample Date	8.18.10	8.18.10	8.18.10	8.4.11	8.4.11	8.4.11	8.4.11	8.4.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	C	D	D	X	D[3]	C[3]	D[3]	X

Table 37 – Highest Impact Tier II EAL Risk Categories for Each Sample (continued)

DU16 **Area 2 - Core PMA** Within the driveway of the Foley property, adjacent to the Thompson property.	PMAK-DU16-A	PMAK-DU16-B	PMAK-DU16-C	PMAK-DU16-D	PMAK-DU16-E
Sample Date	8.3.11	8.3.11	8.3.11	8.3.11	8.3.11
Depth Intervals (' bgs)	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	B	C	C	A	X

DU17 **Area 2 - Core PMA** Within the backyard of the Foley property, adjacent to the Drainage Swale.	KKSC-DU3	PMAK-DU17-A	PMAK-DU17-B	PMAK-DU17-C	PMAK-DU17-D	PMAK-DU17-E
Sample Date	8.19.10	8.5.11	8.5.11	8.5.11	8.5.11	8.5.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0.5-2.0	2.0-4.0	4.0-7.0	7.0-10.0
Highest Tier II EAL Risk Category[1]	C	X	C	B	B	X

DU18 **Area 2 - Core PMA** Within the West Drainage Outfall, adjacent to the intersection of Kilauea Road and Oka Street.	PMAK-DU18-A-P	PMAK-DU18-A-T1	PMAK-DU18-A-T2
Sample Date	8.10.11	8.10.11	8.10.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5
Highest Tier II EAL Risk Category[1]	B	B	B

DU19 **Area 2 - Core PMA** Within the West Drainage Outfall, to the west of DU18.	PMAK-DU19-A
Sample Date	8.11.11
Depth Intervals (' bgs)	0-0.5
Highest Tier II EAL Risk Category[1]	B

DU21 **Area 3 - Potentially Impacted Exposed Surface Soils - Not Previously Sampled** Two separate areas on the Old Mill LLC property.	PMAK-DU21-A
Sample Date	8.10.11
Depth Intervals (' bgs)	0-0.5
Highest Tier II EAL Risk Category[1]	B

Table 37 – Highest Impact Tier II EAL Risk Categories for Each Sample (continued)

DU22 **Area 3 - Potentially Impacted Exposed Surface Soils - Not Previously Sampled** Along the western border of the Old Mill LLC property adjacent to the drainage swale.	**PMAK-DU22-A**
Sample Date	8.5.11
Depth Intervals (' bgs)	0-0.5
Highest Tier II EAL Risk Category[1]	B

DU23 **Area 3 - Potentially Impacted Exposed Surface Soils - Not Previously Sampled** Within the raised planter box along the southern boundary of the Old Mill LLC property.	**PMAK-DU23-A**
Sample Date	8.10.11
Depth Intervals (' bgs)	0-0.5
Highest Tier II EAL Risk Category[1]	B

DU24 **Area 4 - Surrounding Properties** Within the front, back and side yards for the Sansevere property.	**PMAK-DU24-A-P**	**PMAK-DU24-A-T1**	**PMAK-DU24-A-T2**
Sample Date	8.10.11	8.10.11	8.10.11
Depth Intervals (' bgs)	0-0.5	0-0.5	0-0.5
Highest Tier II EAL Risk Category[1]	B	B	B

DU25 **Area 4 - Surrounding Properties** Within the front, back, and side yards of the Hadley property, south of Oka Street.	**PMAK-DU25-A**
Sample Date	8.11.11
Depth Intervals (' bgs)	0-0.5
Highest Tier II EAL Risk Category[1]	B

DU26 **Area 5 - HHA Debris Pit** Along the western borders of the HHA property, west of Building B.	**KKSC-DU1**	**KKSC-DU2**	**KBV-01**	**PMAK-DU26**
Sample Date	8.19.10	8.19.10	1.26.11	8.10.11
Depth Intervals (' bgs)	0-0.5	0-0.5	4.0-6.0	3.0-4.5
Highest Tier II EAL Risk Category[1]	A	B	C[3]	C[3]

Table 37 – Highest Impact Tier II EAL Risk Categories for Each Sample (continued)

DU27 **Area 5 - HHA Debris Pit** Along the western border of the HHA property, south of Building B.	**KKSC-DU2**	**PMAK-DU27**
Sample Date	8.19.10	8.9.11
Depth Intervals (' bgs)	0-0.5	3.0-4.5
Highest Tier II EAL Risk Category[1]	B	C

LEGEND

TCOC = Targeted contaminant of concern (TEQ dioxins or arsenic)
X = No TCOC analytical data available (i.e., sample listed as NA [Not Analyzed] or H [Hold]) on Table 22
[1] = The individual risk categories for TEQ dioxins and arsenic for each sample were compared, and the highest risk category identified was assigned to that sample. This approach was selected to present the most conservative scenario.
[2] = Triplicate Sample
[3]= Tier II EAL Risk Category estimated using 10% of total arsenic concentration to infer the bioaccessible arsenic concentration.

Shading=	Sample collected during current site investigation
Shading=	Sample collected during previous sampling activities (HEER Office or Kauai Environmental)

Fall 2011 Revised Tier I EALs and July2010/Fall 2011 Revised Tier II EALs

9.8.3 Step 3 – Extrapolate Tier II EAL Risk Categories for Areas Where No TCOC Analytical Data Is Available

As part of Step 3, the information from Steps 1 and 2 was used to extrapolate the Tier II EAL risk category for areas where no TCOC analytical data was available (e.g., under buildings, asphalt-paved parking lots, etc.). The confirmed TCOC analytical data for surrounding DUs was used for extrapolating. Under these scenarios, the extrapolated highest impact risk category was only extended halfway into areas where no TCOC data was present.

Cross-sections were also prepared as part of Step 3 to depict the TCOC analytical data by layer, and to better understand the degree of TCOC impacts in the two soil accessibility categories. The cross-sections included the TCOC analytical data from the subject site investigation, as well as the data from previous HDOH and Kauai Environmental sampling activities that overlapped with DUs from the site investigation.

Figure 12 presents an overview of the four cross-section locations (A-A' through D-D'). The four individual cross-sections are shown separately in Figures 13 to 16. The cross-sections show each DU with respect to the Tier II EAL risk categories for the TCOC analytical data. On the cross-sections, solid shading is used for areas where the risk category was determined using confirmed sample analytical data, while a line hatch pattern is used for areas where the risk category was extrapolated based on sample analytical data from surrounding DUs. The highest impact risk category identified among all samples for a given layer was the risk category selected for that layer in the cross- sections; this approach was selected to present the most conservative scenario.

The data presented in the cross-sections was used to generate two site plans that show each DU with respect to the Tier II EAL risk categories for the TCOC analytical data for the two soil previously discussed accessibility categories. Figure 17 depicts the highest impact risk category for each DU for the "readily accessible soil" (0-2 feet bgs) category. Figure 18 depicts the highest impact risk category for each DU for the "deeper soil" (2-10 feet bgs) category. For both figures, the highest impact risk category identified among all samples for a given DU was the risk category selected for that DU in that figure; this approach was selected to present the most conservative scenario.

All extrapolated areas shown on Figures 13-18 should be included in the proposed Environmental Hazard Management Plan (EHMP), until such time that future analytical data confirms the absence of significant TCOC impacts in these areas.

In addition, the HEER Office conducted calculations in order to estimate the volumes of impacted soil throughout the site for each of the four Tier II EAL risk categories. These estimates are provided in Appendix J for reference.

A summary of the findings of the focused evaluation for each of the five site areas, based upon the extrapolated data, is provided below.

9.8.4 TCOC at Area 1

Area 1 consists of DU1 to DU9 that were delineated to address data gaps regarding the extent of COPC along the perimeter of the Core PMA. The following discussions refer to the highest impact risk category identified for each DU with regards to the two soil accessibility categories.

- The findings from Area 1 indicate that none of the nine DUs exhibited Category C or D TCOC-impacted soil in the readily accessible soil (0-2 feet bgs).
- The findings are further summarized as follows:
    - Readily Accessible Soil (0-2 feet bgs): All nine (9) DUs had TCOC in Category B of the applicable Tier II EAL risk categories. There were no Category C or D soils identified in the readily accessible soil, with the exception of one replicate sample from DU4 (PMAK-DU4-B-T2; Layer B [0.5-2.0 feet bgs]). This sample had a concentration of bioaccessible arsenic (23.8 mg/kg) that was slightly above the Category C lower bound of 23 mg/kg; however, the other two replicate samples from DU4 were in Category B. The average bioaccessible arsenic concentration for the triplicate DU4 Layer B samples was in Category B as well. As a result, DU4 was considered to have TCOC in Category B.
    - Deeper Soil (2-10 feet bgs): Two (2) of nine (9) DUs (DU2 and DU5) had TCOC in Category C of the applicable Tier II EAL risk category. All seven of the remaining DUs had TCOC in Category A for the deeper soil.

9.8.5 TCOC at Area 2

Area 2 consists of DU10 to DU19 that were delineated to further characterize and delineate the vertical extent of COPC in the Core PMA (DU10 to DU17), and assess if the West Drainage Outfall (DU18 and DU19) was impacted by historical PMA activities. The following discussions refer to the highest impact risk category identified for each DU with regard to the two soil accessibility categories.

This investigation confirmed that the Core PMA is composed of the Old Mill LLC property (DU10 and DU11), Thompson property (DU12 through DU15), and Foley property (DU16 and DU17). Note that DU10 exhibited the most significant TCOC impact.

- The findings from Area 2 indicate that eight (8) of the 10 DUs have Category C or D TCOC-impacted soil in the readily accessible soil (0-2 feet bgs). These findings warrant further action in order to mitigate exposure pathways to the impacted soil identified in Area 2. Note that the two (2) DUs which did not contain Category C or D soil were located within the western off-site drainage outfall.
- The findings are further summarized as follows:
    - Readily Accessible Soil (0-2 feet bgs): Eight (8) of the 10 DUs had TCOC in Category C or D of the applicable Tier II EAL risk categories. This included four DUs (DU10, DU12, DU14, and DU15) with TCOC in Category D, and three DUs (DU11, DU13, DU16, and DU17) with TCOC in Category C.
    - The remaining two (2) DUs (DU18 and DU19), which were located within the off-site West Drainage Outfall, had TCOC in Category B.

- <u>Deeper Soil (2-10 feet bgs)</u>: Five (5) of 10 DUs had TCOC in Category C or D of the applicable Tier II EAL risk categories. This included three DUs (DU10, DU14, and DU15) with TCOC in Category D, and two DUs (DU12 and DU16) with TCOC in Category C. Of the remaining DUs, two DUs (DU13 and DU17) had TCOC in Category B, one DU (DU11) had TCOC in Category A.

  Two (2) DUs (DU18 and DU19 [only Layer A samples were collected]) had no available TCOC data for the accessible soil. The risk categories for DU18 and DU19 were not extrapolated because there was no TCOC analytical data for any surrounding DUs. As previously noted, DU18 and DU19 were located within the western off-site drainage outfall, and only surface sediment samples were collected from the 0-0.5 foot bgs interval.

9.8.6 TCOC at Area 3

Area 3 consists of DU21 to DU23 that were delineated to assess the potentially impacted and exposed surface soils on the Old Mill LLC property that were not previously sampled by the HEER Office. The following discussions refer to the highest risk category identified for each DU with regards to the two soil accessibility categories.

- <u>Readily Accessible Soil (0-2 feet bgs)</u>: The findings from Area 3, based upon extrapolation of data as presented in cross-sections C-C' and D-D', indicate that DU22 and DU23, and the portion of DU21 along Aalona Street, exhibited Category C or D TCOC-impacted soil in the readily accessible soil (0-2 feet bgs).

  Each of these DUs (DU21, DU22, and DU23) was comprised of surface samples (0-0.5 foot bgs) which was classified as Category B. However, based upon extrapolation of the assessment data, as presented in Cross-Sections C-C' and D-D', the following is concluded with regard to readily accessible soil (0-2 feet bgs):

  - DU21 is comprised of two separate areas. The portion of DU21 along the western border of the Old Mill LLC property, adjacent to Aalona Street, was extrapolated to have TCOC in Category C below the 0-0.5 foot bgs interval. However, this portion of DU21 is grass-covered, and is bordered by small trees and boulders, forming an island between the street and building away from the entrance. Because at least the top 6 inches of soil has been confirmed to be Category B, no mitigative action is warranted for this portion of DU21. The Aalona Street portion of DU21 will be managed under a property-specific EHMP.

    The portion of DU21 along the southern border of the Old Mill LLC property, adjacent to Oka Street, had TCOC in Category B to a depth of 2 feet bgs, based upon soil boring data obtained from DU9 (which was coincident with DU21). No mitigative action is warranted for this portion of DU21.

  - DU22 is immediately contiguous with DU10. Based upon the proximity to DU10, soil underlying the 0-0.5 foot bgs interval is extrapolated to be Category D. Because of the contiguous nature of DU22 with DU10, the surface cover of bare soil, and the routine use of this DU for parking, further action is warranted at DU22 to mitigate exposure pathways to the underlying impacted soil.

  - DU23 was extrapolated to have TCOC in Category C below the 0-0.5 foot bgs interval. DU23 is a raised planter area with a tall bushes along the perimeter, thereby minimizing accessibility. It is also the location of the Old Mill LLC septic system. Because at least the top 6 inches of soil is vegetated, and has been confirmed to be Category B, no mitigative action is warranted for DU23. DU23 will be managed under a property-specific EHMP.

- Deeper Soil (2-10 feet bgs): Based upon extrapolation, DU22 had TCOC in Category D, whereas DU23 was Category C. The portion of DU21 adjacent to Aalona Street also had TCOC in Category C. The portion of DU21 adjacent to Oka Street, had TCOC in Category A.

9.8.7 TCOC at Area 4

Area 4 consists of DU24 and DU25 that were delineated to assess if two surrounding residential properties, south of Oka Street, were impacted by past PMA activities. The following discussions refer to the highest impact risk category identified for each DU with regards to the two soil accessibility categories.

- The findings from Area 4 indicate that neither of the DUs exhibited Category C or D TCOC-impacted soil in the readily accessible soil (0-2 feet bgs).
- The findings are further summarized as follows:
  - Both DUs had TCOC in Category B. There were no Category C or D soils based upon the applicable Tier II EAL Risk Categories for Area 4.

No samples were collected below 0.5 foot bgs in Area 4; therefore, no TCOC data is available for the deeper soil (2-10 feet bgs) category. The risk categories for DU24 and DU25 were not extrapolated because there was no TCOC analytical data for any surrounding DUs.

9.8.8 TCOC at Area 5

A focused evaluation was conducted regarding the impacted soil in Area 5, consistent with the methodology described above for Areas 1-4. Because the Area 5 DUs were associated with the HHA property debris pit, all of the full PMA COPC were included in the evaluation, not only the TCOC. The findings of the evaluation are provided below.

Area 5 consists of DU26 and DU27 that were delineated to evaluate the extent of buried debris and trash associated with the debris pit previously identified on the HHA property.

- In Area 5, both of the DUs had Tier I EAL exceedances of the full PMA COPC in the debris layer (3-4.5 feet bgs). This included:
  - DU26 had exceedences of total arsenic, lead, and benzo(a)pyrene in the sample from 3-4.5 feet bgs.
  - DU27 had exceedences of TEQ dioxins, total arsenic, and lead in the sample from 3-4.5 feet bgs.
- The findings from Area 5 indicate that both of the DUs had Category C soils in the deeper soil (2-10 feet bgs).
- The findings are further summarized as follows:

- Readily Accessible Soil (0-2 feet bgs): DU26 and DU27 are classified as Category B.
- Deeper Soil (2-10 feet bgs): DU26 and DU27 are classified as Category C.

9.8.9 Exposed Soil Requiring Immediate Action

The data from Steps 1-3 was used to generate a site plan that depicts areas with TCOC-impacted soil that require immediate action to mitigate potential exposure to Category C or D impacted soil. Figure 19 depicts exposed soil in the “readily accessible soil” (0-2 feet bgs) category that requires immediate action. For this figure, exposed soil was considered any area that that was not covered by hardscape or impervious surfaces, such as buildings or asphalt pavement. Any DU with exposed soil that had Category C or Category D TCOC-impacted soil from 0-2 feet bgs was included in Figure 19. The areas requiring immediate action were extended at the Thompson property and Foley property to include portions of the properties that are inferred to be impacted based on the extrapolations completed for the cross-sections.

Referring to Figure 19, there were two small non-contiguous areas identified on the Old Mill LLC property, associated with DU21 and DU23. Only the portion of DU21 along the western border of the Old Mill LLC property, adjacent to Aalona Street, had TCOC in Category C from 0-2 feet bgs. It is noted, as previously discussed, that the Category C classification is a result of deeper soil extrapolation, based upon the cross-sections; the 0-0.5 foot bgs interval is considered Category B based upon analytical data. As such, only this portion of DU21 is included in Figure 19 for immediate action; however, in the instance of this portion of DU21, it is expected this would be addressed by an EHMP, rather than actual remedial action.

Similarly, DU23, which is adjacent to the bakery building on the Old Mill LLC property, is the location of the property’s septic system. As with DU21, the 0-0.5 foot bgs interval was classified as Category B using analytical data, whereas the deeper extent is inferred to be Category C by extrapolation based upon the cross-sections. The vicinity of DU23 is heavily landscaped with tall foliage, generally limiting access. Further, the area of DU23 is the location of the Old Mill LLC property’s septic system. Due to the presence of the septic system, and the landscaped nature of this location, as well as the Category B soil on the surface, it is expected that any potential immediate actions in this vicinity would be limited, generally to any future septic system repair or upgrade activities. It is expected that this area would be addressed by an EHMP, rather than any potential physical remedial actions in the near term.

10 Immediate Remedial Action Objectives

10.1 Immediate Remedial Action Objectives

The HEER Office conducted a review of the site investigation findings, which included the sample analytical results, locations of samples with screening criteria exceedances, updated EHE, and focused evaluation of TCOC. The HEER Office considered potentially applicable technologies to address the impacted soil at the site with an emphasis on immediate implementability, given the expedited nature of the site investigation.

Based on their review and evaluation, the HEER Office has developed the following objectives for the proposed immediate remedial action at the site:

Thompson and Foley Properties:

- For these properties, the yards will be restored to unrestricted residential use in the top two feet of soil in open yard areas, through physical removal of soils to 2 feet bgs (if possible). Long-term management will be required for all soils below hardscape or impervious surfaces (e.g., below buildings, driveways and sidewalk areas), as these soils are presumed to be contaminated. Soils in open yard areas below 2 feet bgs will be demarcated with a barrier material and managed in-place. The following conditions pertain to soil disposal from the yards:
    - Soils have been characterized in-place, and do not fail the TCLP screening criteria for arsenic. The characterization data is adequate for landfill determination and does not require additional sampling after excavation. The Kauai County Engineer has agreed to provide confirmation of this agreement upon review of the currently available site data.
    - Since soils have not been determined to be hazardous waste, soils may go to a solid waste landfill, pending the County of Kauai's approval.
    - Soils could be managed on-site within the adjacent commercial property boundaries, for example, within a constructed cap and drainage system.
    - The Thompson and Foley properties will be subject to deed restrictions, environmental covenants (under Universal Environmental Covenant Act [UECA]), and implementation of property-specific EHMPs.

Old Mill LLC Property:

- This property will be restored to commercial/industrial use, with contaminated soils left in-place and managed under a permanent cap structure that will include a stormwater drainage system to replace the existing Drainage Swale (DU10 and DU11). Long-term management will be required for all soils below hardscape or impervious surfaces, including the multi-use building, parking lot, and sidewalk areas, as these soils are presumed to be contaminated.

- All exposed soils at the Old Mill LLC property have been characterized in-place at the 0-0.5 feet interval, and the property boundaries have been characterized at depth to the extent of contamination. Exposed soils in the Drainage Swale area (DU10) have been characterized to 10 feet bgs. Within DU10, the 0.5-2 feet bgs depth interval, and the 7-10 feet bgs depth interval, both fail the TCLP screening criteria for arsenic, and the 0-0.5 feet bgs depth interval is presumed to fail, based on the total arsenic concentration.
- Soils that do not fail TCLP may be disposed of at a solid waste landfill. Soils that do not exceed Tier II commercial/industrial EALs for any contaminant may be used as daily cover at the Kekaha Landfill, located in Kekaha, on the Island of Kauai.
- Soils that fail TCLP will be managed entirely on-site to the extent practicable. Soils that are removed from the site and fail TCLP would require disposal at a RCRA landfill.
- Soils can be managed on-site in one of four ways, without triggering a RCRA hazardous waste determination. Excavation is allowed for the purpose of treatment or containment, if the work takes place entirely on-site.
    1. Excavate and place under cap: This involves excavating the impacted soil, consolidating the impacted soil, followed by placement of a clean cover cap over the impacted soil. This is acceptable if the soils are not containerized or removed from the site, which would trigger a RCRA hazardous waste determination. Deed restrictions will be implemented for the property.
    2. Treat soil in-situ: This involves immobilizing the contaminants through in-situ soil treatment technologies, followed by placement of a clean cover cap over the treated soil. Deed restrictions will be implemented for the purpose of treating the soil at the property.
    3. Excavate, treat soil ex-situ, and place soil back in the ground: This involves excavating the impacted soil, immobilizing the contaminants through ex-situ soil treatment technologies, followed by placing the treated soil back in the ground. No deed restrictions will be required if the treated soil has contaminant concentration below the residential cleanup standards.
    4. Excavate, treat soil ex-situ to concentrations below TCLP screening criteria, and then take treated soil to a solid waste landfill: This will require compliance with the landfill's permit conditions.
- The Old Mill LLC property will be subject to deed restriction, environmental covenant, and implementation of property-specific EHMP.

11 Summary and Recommendations

Tetra Tech completed a site investigation at the PMA of the former Kilauea Sugar Company Ltd. Mill, along Aalona Street and Oka Street in Kilauea, on Kauai. The site was formerly part of a sugarcane mill operation that operated from approximately 1877 to 1972. The site currently has 18 different properties in a residential setting, and consists predominantly of single-family homes. The HEER Office developed the scope of work and directed the site investigation.

The site investigation was to further characterize and delineate the extent and magnitude of COPC associated with the portion of the site defined as the Core PMA. The investigation focused on delineating the vertical and horizontal extent of identified COPC in and next to the Core PMA. Pending the results of the site investigation, the HEER Office will evaluate options for implementing a remedial action to reduce or eliminate exposure pathways to the impacted soil.

11.1 Field Activities

The field activities for the investigation occurred in July and August 2011. During the course of the investigation, 96 soil borings were advanced throughout the 26 DUs at the site. The DUs were grouped into five distinct site areas (Areas 1 to 5). Tetra Tech collected 118 soil samples from the 26 DUs. The DU samples were submitted for analysis of COPC that were grouped into four categories: primary COPC, full PMA COPC, waste categorization COPC, and other COPC. The specific COPC that each sample was analyzed for depended on the DU and the layer from which the sample was collected.

11.2 Findings

The analytical results indicated that several soil samples had one or more COPC that exceeded the applicable HEER Office Tier I EALs. At least one COPC in soil samples from 23 of the 26 DUs exceeded the applicable HEER Office Tier I EALs. The only DUs without any COPC exceedances were DU6, DU7, and DU9. The summary count of 23 of 26 DUs included total arsenic and lead COPC exceedances. The HEER Office uses bioaccessible arsenic data rather than total arsenic data for human health risk evaluation, and lead is not considered to be related to the PMA and is beyond the scope of this site investigation. As such, the summary count of DUs with COPC exceedances (excluding total arsenic and lead) is 12 of 26 DUs.

TEQ dioxins and arsenic (including total arsenic and bioaccessible arsenic) were the two most prevalent COPC with exceedances. Based on the analytical results from, the Core PMA (the primary area of impact) was confirmed to be composed of three properties: the Old Mill LLC, Thompson, and Foley properties. The Core PMA included DU10 to DU17 in Area 2, with DU10 having the most significant COPC impact.

After the initial screening against the HEER Office Tier I EALs, the TEQ dioxins and arsenic analytical results were compared to the HEER Office Tier II EAL Risk Categories. These two COPC were selected because the HEER Office has developed specific Tier II EALs for them. A brief summary of the findings of the Tier II EAL Risk Category screening for each area are presented below.

11.2.1 Area 1 (Perimeter of Core PMA) Summary

The majority of the Area 1 DUs (DU1 through DU9), had minimal TEQ dioxins and arsenic impacts.

- The most impacted soils in DU1, DU3, DU4, and DU6 through DU9 were classified as Category B soils, including readily accessible soil (0-2 feet bgs).
- The most impacted soils in DU2 and DU5 were classified as Category C soils. However, the Category C soils in each of these DUs was located at depths below 2 feet bgs. Readily accessible soil (0-2 feet bgs) in DU2 and DU5 is considered Category B.

11.2.2 Area 2 (Core PMA) Summary

Area 2 is comprised of eight (8) DUs located off of Aalona Street(DU10 through DU17), and two (2) off-site DUs (DU18 and DU19) which are located at the off-site West Drainage Outfall.

The eight (8) Area 2 DUs located off of Aalona Street, including DU10 through DU17, had the most significant TEQ dioxins and arsenic impacts compared to any other site area.

- The most impacted soils in DU10 at the Old Mill LLC property were classified as Category D soils, with Category D soils present in the readily accessible soil (0-2 feet bgs). DU10 is currently a drainage swale.
- The most impacted soils in DU11 at the Old LLC property were classified as Category C soils, with Category C soils present in the readily accessible soil (0-2 feet bgs). DU11 is currently a drainage swale.
- The most impacted soils in DU12, DU14, and DU15 at the Thompson property were classified as Category D soils, with Category C soils present in the readily accessible soil (0-2 feet bgs). The Thompson property is occupied by a single-family residence.
- The most impacted soils in DU13 at the Thompson property were classified as Category C soils, with Category C soils present in the readily accessible soil (0-2 feet bgs). As indicated above, the Thompson property is occupied by a single-family residence.
- The most impacted soils in DU16 and DU17 at the Foley property were classified as Category C soils, with Category C soils present in the readily accessible soil (0-2 feet bgs). The Foley property is occupied by a single-family residence.

The two (2) off-site DUs (DU18 and DU19) located at the West Drainage Outfall exhibited minimal TEQ dioxins and arsenic impacts.

- The most impacted soils in DU18 and DU19 were classified as Category B soils. Sampling in these DUs was limited to the surface (0-0.5 feet bgs) interval.

11.2.3 Area 3 (Potentially Impacted Exposed Surface Soils at Old Mill LLC Property) Summary

All of the Area 3 DUs had minimal TEQ dioxins and arsenic impacts in the interval sampled (0-0.5 foot bgs).

- The most impacted soils which were sampled in DU21 to DU23 were classified as Category B. Sampling in these DUs was limited to the surface (0-0.5 feet bgs) interval.
- Based on extrapolated data using Cross-Sections C-C' and D-D', the following additional interpretations are noted for soil below the 0-0.5 foot bgs interval:
  - The portion of DU21 which extends along Oka Street is underlain by Category A soils at depth (below 6 inches), based upon analytical data from DU9.
  - The portion of DU21 which extends along Aalona Street is assumed to be underlain by Category C soils at depth (below 6 inches). This is currently an area between Aalona Street and the sidewalk comprised of lawn and small trees, with a boulder perimeter.
  - DU22 (which abuts DU10) is assumed to be underlain immediately by Category D soils at depth (below 6 inches). This is an exposed soil area used for parking.
  - DU23 (adjacent to the bakery building) is assumed to be underlain by Category C soils at depth (below 6 inches). However, it is further noted that this is the location of the Old Mill LLC septic system, and the area is landscaped, with a perimeter of tall bushes.

11.2.4 Area 4 (Surrounding Residential Properties Across Oka Street) Summary

Both of the Area 4 DUs, located across Oka Street from the site, had minimal TEQ dioxins and arsenic impacts.

- The most impacted soils in DU24 and DU25 were classified as Category B soils. Sampling in these DUs was limited to the surface (0-0.5 feet bgs) interval. Both DU24 and DU25 are occupied by single-family residences.

11.2.5 Area 5 (HHA Property Debris Pit) Summary

Both of the Area 5 DUs had moderate TEQ dioxins and arsenic impacts.

- The most impacted soils in DU26 and DU27 were classified as Category C soils. Sampling in these DUs during the August 2010 investigation was limited to the depth interval of approximately 3-4.5 feet bgs.

  However, samples collected by the DOH in these DUs indicated that surface soil in the 0-0.5 foot bgs interval was considered Category B.

  The HHA property is occupied by a public housing development.

11.3 Updated EHE Summary

The updated EHE indicated that there were direct exposure and gross contamination soil hazards associated with the impacted soil at the site. Potential vapor intrusion, terrestrial ecology through runoff, and leaching soil hazards were eliminated for the site, based on site conditions.

A focused evaluation was conducted for two selected TCOC, TEQ dioxins and arsenic, because they were the primary drivers for potential human health risks, and were the two most prevalent COPC at the site. The evaluation focused on TCOC impacts in the readily accessible soil (0-2 feet bgs).

During the evaluation, the degree of impacts for the TCOC in each DU with respect to the applicable HEER Office Tier II EAL Risk Categories was assessed. The evaluation concluded the following:

- In Area 2, the readily accessible soil (0-2 feet bgs) in DU10 through DU17 was identified to be moderately to heavily impacted, and thereby classified as Category C and D. These findings warrant further action in order to mitigate exposure pathways to the impacted soil identified in DU10 through DU17.
- In Area 3, the readily accessible soil (0-2 feet bgs) in DU22, DU23, and the portion of DU21 along Aalona Street was identified by extrapolation to be moderately to heavily impacted (below the sampled depth of 0-0.5 feet bgs) and thereby classified as Category C and D.

  It is noted, however that the 0-0.5 foot bgs interval in all three DUs was classified as Category B based upon analytical data. Further action for these DUs would be comprised of an EHMP rather than mitigative action based upon use and accessibility.
- The readily accessible soil (0-2 feet bgs) in Areas 1, 4, and 5, and the West Drainage Outfall portion of Area 2 was identified to be only minimally impacted, and thereby classified as Category B.

11.4 Pending Actions

- The HEER Office has proposed to implement an Immediate Remedial Action at the Core PMA (Thompson property, Foley property, and Old Mill LLC property [drainage swale portion and abutting gravel parking areas only]) based on their review and evaluation of the site investigation findings.
- The immediate remedial action will focus on mitigating exposure pathways to the TCOC-impacted readily accessible soil (0-2 feet bgs) in DU10 through DU17, and managing potential exposure pathways related to DU21 through DU23.
- Additional actions related to the immediate remedial action will include the following:
  - A fact sheet will be prepared that summarizes the key findings of the site investigation in a user-friendly format. The fact sheet will be sent to residents at the site neighborhood, including all properties where samples were collected.
  - A detailed letter will be prepared and sent to each of the three properties to be included in the proposed Immediate Remedial Action (Thompson, Foley, and Old Mill LLC properties). The letter

will identify the site-specific findings for each of the properties, and will discuss the proposed immediate remedial actions that will be conducted.

- Property-specific EHMPs will be prepared for any property or area at the site with residual contaminated or impacted soils. The EHMPs will outline future land use guidelines and restrictions, including applicable engineering controls and institutional controls. The EHMPs should be updated as site conditions change, including after the Immediate Remedial Action is completed.
- The Thompson, Foley, and Old Mill LLC properties will be subject to deed restrictions, environmental covenants, and implementation of property-specific EHMPs.

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